



The evolving diversity of the geodynamics community: Ada Lovelace Workshop participants from 1987 to 2024

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Abstract.

Having a representative, diverse scientific community is a catalyst for impactful and innovative science, and opens new long-term research directions. Here, we present the first diversity study of the computational geodynamics community, by analysing the participants of the Ada Lovelace Workshop over almost 40 years, from its inception in 1987 to 2024. We collected the year of highest degree obtained, the primary country and institution affiliation, and the organisational and scientific contributions of all attendees and infer their genders. We then analysed gender, career stage, and geographical diversity.

The data shows that over the last four decades, (1) the percentage of women participants at the Ada Lovelace Workshop has increased from 10% to approximately 35% (across all career stages); (2) the current percentage of women attending the workshop is similar to that of other geosciences conferences; (3) the geographic diversity has increased, with nearly double the amount of countries represented in recent years compared to the late 1980s and consistently over triple the amount of institutions represented in the last decade compared to 1987; (4) the percentage of participants with affiliations from countries in the Global South has remained low ($\ll 5\%$) throughout the workshop's history; and (5) student participation has increased to over 38%. We further find that lower attendance costs coincide with a more diverse group of participants, indicating that removing financial barriers could promote a greater diversity in attendees. A gender-balanced scientific organising committee (SOC) could also be conducive to more diversity, as the percentage of women on the SOC correlates with the percentage of women attendees. Given the rate of increase over the past four decades, we project that gender balance will be reached within the next couple of workshops.

1 Introduction

Numerous studies have shown that innovation in science, technology, engineering, and mathematics (STEM) is aided by the *inclusion* (see Table 1 for the definitions of italicised words used in this study) of a diverse set of individuals in the workforce (e.g., Page, 2008; Herring, 2009; Freeman and Huang, 2014; Smith-Doerr et al., 2017; Jackson et al., 2019). The



novel perspectives that people from different backgrounds bring (Kozłowski et al., 2022) allow for more effective, creative, and innovative solutions to problems. To reach scientific breakthroughs, it is therefore crucial that academia is a diverse and inclusive environment based on merit (Merton, 1973). To provide a metric for *diversity*, one can look at global and national demographics as an objective baseline. STEM demographics currently do not reflect this baseline (Sugimoto and Larivière, 2023; Bhopal, 2022; Higher Education Statistics Agency, 2025). Indeed, systemic barriers to acquiring skills and knowledge as well as stereotypes remain in place for certain groups (Eom et al., 2025), reflecting many socio-economic dimensions such as gender, race, geographical location, sexual orientation, and cultural and religious backgrounds. Efforts to increase the diversity and *equity*, included in the JEDI principles (Justice, Equity, Diversity, Inclusion; Genua-Olmedo et al., 2025, Table 1), in science are critical to dismantle such barriers and promote just practices. Data is key to reveal the scale of the diversity problem in STEM and to assess the effect of measures taken to address it.

Traditionally, diversity in science has largely focused on gender diversity, because although roughly 50% of the global population consists of women, these numbers are not reflected in the demographics of people who do science (Sugimoto and Larivière, 2023). In 2024, UNESCO (Straza, 2024) reported that women in G20¹ countries represented on average only about 35% of college graduates in STEM fields and 22% of the STEM workforce. Fair and equitable pay across genders is also not yet a reality. For example, there is at least a 5% gender pay gap in STEM occupations in 80% of countries globally (El Achkar, 2023) and Straza (2024) reports that women in STEM earn 85% of men's pay in eight of the ten G20 countries for which this data is available. Women are also less likely to receive research grants than men, and when they do, they receive smaller amounts (Faber et al., 2019; Sugimoto and Larivière, 2023; European Commission and Directorate-General for Research and Innovation, 2025). Multiple factors influence participation, achievement, and progression of women in STEM, such as stereotypes, societal pressures, and cultural biases (Eom et al., 2025; Sugimoto and Larivière, 2023). This is particularly pronounced in advanced stages along the career ladder (Straza, 2024), despite there being no difference in performance between girls and boys worldwide in primary and secondary education (Yang et al., 2018).

Another aspect of diversity is geographical: participation in STEM depends on where research is being done and often reflects underlying factors such as economy and welfare, connectivity (geopolitical alliances), and culture (linguistics, social, and religious norms). People working in certain countries or with certain nationalities therefore have fewer opportunities to participate in STEM. For example, research funding is heterogenous even within wealthy economic blocks such as the European Union; the 13 member states that joined the European Union in the major enlargements of 2004, 2007, and 2013, consisting mostly of Eastern and Southern European countries, won only 7.2% of the total ERC funding in 2020 (Valkárová, 2023), despite equalling 22.5% of the EU population. On an individual level, researchers from African, Asian, and Latin American countries also often face bureaucratic hurdles to participation in STEM research (e.g., Sarpong and Wube, 2025).

A STEM subfield, the geosciences face substantial diversity problems (e.g., Ranganathan et al., 2021; Sedlacek et al., 2025). They have a long history of colonising practices that still reverberate today in the helicopter or parachute science that is often associated with field work practices (Dowey et al., 2021; Watson, 2021). To reveal the extent of the diversity problem in

¹Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Türkiye, the United Kingdom, the United States of America, the African Union, and the European Union.



55 geosciences, studies use a range of approaches. One approach is to analyse authorship as a proxy for demonstrating who has a
 voice in science (Sugimoto and Larivière, 2023). Lerner et al. (2023) show that 40% of volcanology papers do not include any
 authors with an affiliation in the country of the studied volcano. In terms of gender distribution, Pico et al. (2020) found that
 13–30% of first author names are women’s names. Individual subdisciplines of the geosciences show similar statistics, with
 Ermert et al. (2023) finding that the probability that a woman is the first author of a seismology paper is 28%. Such authorship
 60 analyses become harder as science becomes more interdisciplinary, and publication statistics are less easily available.

Another approach to map the diversity of geoscience communities is based on gathering demographic data from confer-
 ence participants. Toth et al. (2020) showed that approximately 33% of the attendees of the European Geosciences Union
 (EGU) General Assembly — the largest geosciences conference in Europe with approximately 20,000 participants — are
 women. Women conveners increased from 25.9% in 2015 to 30.1% in 2018 (Toth et al., 2020). As such, women remain under-
 65 represented compared to the general population. The number of early-career scientists (ECS; defined by EGU as “a student,
 a PhD candidate, or a practising scientist who received their highest certificate (e.g. BSc, MSc or PhD) within the past seven
 years”) attending the conference increased from 43% to 52% from 2015 to 2018. Conference participant demographics can
 also be analysed for smaller subfield conferences. Assembling data from the European Astrobiology Network Association
 (EANA) conferences with typically 150–250 participants, Noack et al. (2026) found that women typically make up 30–45%
 70 of participants. In addition, there is a large share of early-career scientists at these conferences, with 63% of participants being
 ECS in 2024. Similarly, Lefebvre and Bernhard (2024) reported that approximately a third of participants for the conferences
 on MARine and RIVER Dune dynamics (MARID, <100 participants) were women, and 30% of participants were students, who
 represented a disproportionately large part of the poster presentations compared to talks. Other forms of conference diversity
 are not typically analysed.

75 Geodynamics is a small field within geosciences that studies the interior dynamics of the Earth and planets (Van Zelst et al.,
 2022). It encompasses the dynamics of planetary cores, mantles, and crusts; spans scales from individual grain contacts to the
 fate of entire tectonic plates; and links with, e.g., seismology, tectonophysics, and petrology. As members of the geodynamics
 community, we became curious as to the diversity of our field. Therefore, we took it upon ourselves to map the diversity of our
 community over time and present the first quantitative data. Taking inspiration from the aforementioned studies on conference
 80 participants, we look at the participants of the Ada Lovelace Workshop as a proxy for the diversity of the geodynamics com-
 munity. This workshop has been held roughly biannually since 1987 (albeit under several different names) with over a hundred
 participants attending each time in recent years. It focuses on modelling mantle and lithosphere dynamics and is therefore
 inherently biased towards the modelling aspect of the geodynamics community. However, we consider this representative of
 the community as a whole, since modelling makes up a large part of geodynamic research. By quantifying the diversity in
 85 gender, career, and country of affiliation of the participants of the Ada Lovelace Workshop over time (detailed in Section 2),
 we show how the diversity of the geodynamics community has evolved since 1987 (Section 3). We identify areas in which this
 diversity could be improved and give recommendations towards this goal (Section 4). At the current rate of increase of women
 participation, we project that *gender balance* (starting at 40%) of the participants at the workshop will be reached within the
 next few iterations of the workshop, whereas *gender parity* (50%) is predicted to occur for the first time in 2043.



Table 1. Definitions of Justice, Equity, Diversity, and Inclusion (JEDI)-related terms that we use throughout the text.

Diversity	refers to the differences found in people, covering a range of features, backgrounds or personal characteristics, including but not limited to sex, race or ethnicity, colour, gender, language, religion or belief, political or any other opinion, membership of a national minority, disability, socio-economic background, geographical origin, cognitive makeup, age, and sexual orientation and gender identity. ¹
Equality	refers to having equal rights, responsibilities and opportunities. ²
Equity	refers to the provision of fairness and justice in the distribution of benefits and responsibilities. ²
Gender balance	refers to approximately equal (40–60%) participation of women and men. ³
Inclusion	refers to the practice or policy of including and integrating all people and groups in activities, organisations, political processes, etc., especially those who are disadvantaged, have suffered discrimination or are living with disabilities. ²
Intersectionality	refers to the ways in which sex and gender intersect with other personal characteristics/identities, and how these intersections contribute to unique experiences of discrimination. ²
Justice	refers to the principle that people are treated impartially, fairly, and reasonably. ⁴
Parity	refers to equality in amount or number (e.g., 50:50 gender parity). ⁴
Representation	refers to how, how often, and in what roles individuals or groups are portrayed or included. ⁴

¹European Union EXTERNAL ACTION (2026); ²European Institute for Gender Equality (2026); ³European Commission and Directorate-General for Research and Innovation (2025); ⁴Oxford English Dictionary (2026)

90 **2 Methods**

2.1 A definition of the geodynamics community

To assess how the diversity of the geodynamics community has evolved over time, it is crucial to define exactly who forms the geodynamics community. This is non-trivial, as the field spans a variety of topics, techniques, and scales and is highly interdisciplinary. It is therefore challenging to pinpoint a combination of keywords that accurately characterises the field in
95 publications, and geodynamical processes are often mentioned in interdisciplinary publications. Consequently, the approach employed in diversity studies using automated methods to query the publication record (e.g., Pico et al., 2020; Ermert et al., 2023) is not suitable for geodynamics.

An alternative method is to define the geodynamics community through conference participation, similarly to the approach of Noack et al. (2026), who assumed that the participants of the EANA conferences mirrored the diversity of the astrobiology
100 community. In Europe, abstract submissions to sessions organised in the Geodynamics Division of the EGU could be used as a proxy for identifying the geodynamics community. In contrast, no Geodynamics sections exist at other large meetings, such as the American Geophysical Union or the Japan Geoscience Union, whose conference abstracts' data would add a more comprehensive, global sense of the community. However, to our knowledge, none of these scientific societies have comprehensive data sets on the authors of these abstracts freely available for the purposes of a diversity study. We therefore



105 limit our study to the participants of a smaller, European workshop — the Ada Lovelace Workshop —, that captures the core
 of the (computational) geodynamics community, at least from a European viewpoint.

2.2 The Ada Lovelace Workshop

From 1987 to 2024, the *International Workshop on Modelling Mantle and Lithosphere Dynamics* took place 18 times, hosted
 in eight European countries (see Figure 1; Appendix A). It was organised every two years with two exceptions: the workshop
 110 did not occur in 1999 for reasons unknown to the authors, and it was postponed by a year during the COVID-19 pandemic
 such that the 2021 edition ultimately took place in 2022. The first *Workshop on Numerical Simulation of Mantle Convection*
 was held in Germany and had only 19 participants. Subsequent editions followed with slightly varying names and increased
 participation (see Appendix A). Participant numbers varied around 60 in the 1990s, grew to over 90 in 2001, and have stayed
 between 96 and 139 ever since (Figure 1). In 2011, the EGU became a patron of the workshop, and in 2019 the workshop
 115 was integrated into the EGU Conferences series. This resulted in stronger financial support for and a focus on early career
 scientists. That same year, it was renamed the *Ada Lovelace Workshop on Modelling Mantle and Lithosphere Dynamics* in
 honour of Ada Lovelace (1815–1852), a mathematician who is generally considered to be the first computer programmer, as a
 nod to the significant computational component in geodynamics. Throughout this work, we will refer to the workshop and all
 its various iterations as the ‘Ada Lovelace Workshop’.

120 Throughout the years, the scope and focus of the Ada Lovelace Workshop changed. Whereas the scope was at first limited to
 global mantle convection, it was extended to lithosphere dynamics by the third workshop. An earlier focus on group discussions
 (e.g., on numerical models leading to the Blankenbach et al. (1989) benchmarking paper) was broadened to sharing the wide
 breadth and state-of-the-art developments in numerical geodynamics research. This change in scope is reflected in the changing
 format of the workshop. In earlier iterations, the scheduled programme consisted solely of talks, and while bringing one or
 125 multiple posters was encouraged, they were not pre-assigned or acknowledged in the conference programme. Starting in 2001,
 workshop programmes listed both oral and poster presenters by name. The year 2001 also marked the transition to invite-
 only oral presentations with poster presentations for the rest of the participants. Before that, some workshop editions invited
 speakers, some had people apply for talks, and some seem to have had a mixture of both. The abstract and programme book
 of 2011 first mentions specific timeslots dedicated to discussions between ECS and speakers. We took these changes in format
 130 over time into account in the analysis of the type of contribution by participants in our study and have indicated them in the
 figures.

2.3 Workshop participant data collection

We collected participant lists from the conference booklets for each workshop, which were provided by the online archive of
 the German Geophysical Society (Deutsche Geophysikalische Gesellschaft (DGG), 2026). For each participant, we retrieved
 135 their gender and the year they obtained their highest degree (usually a PhD) from institute webpages, PhD thesis databases,
 ORCIDs, Google Scholar, social media profiles, and personal communication.

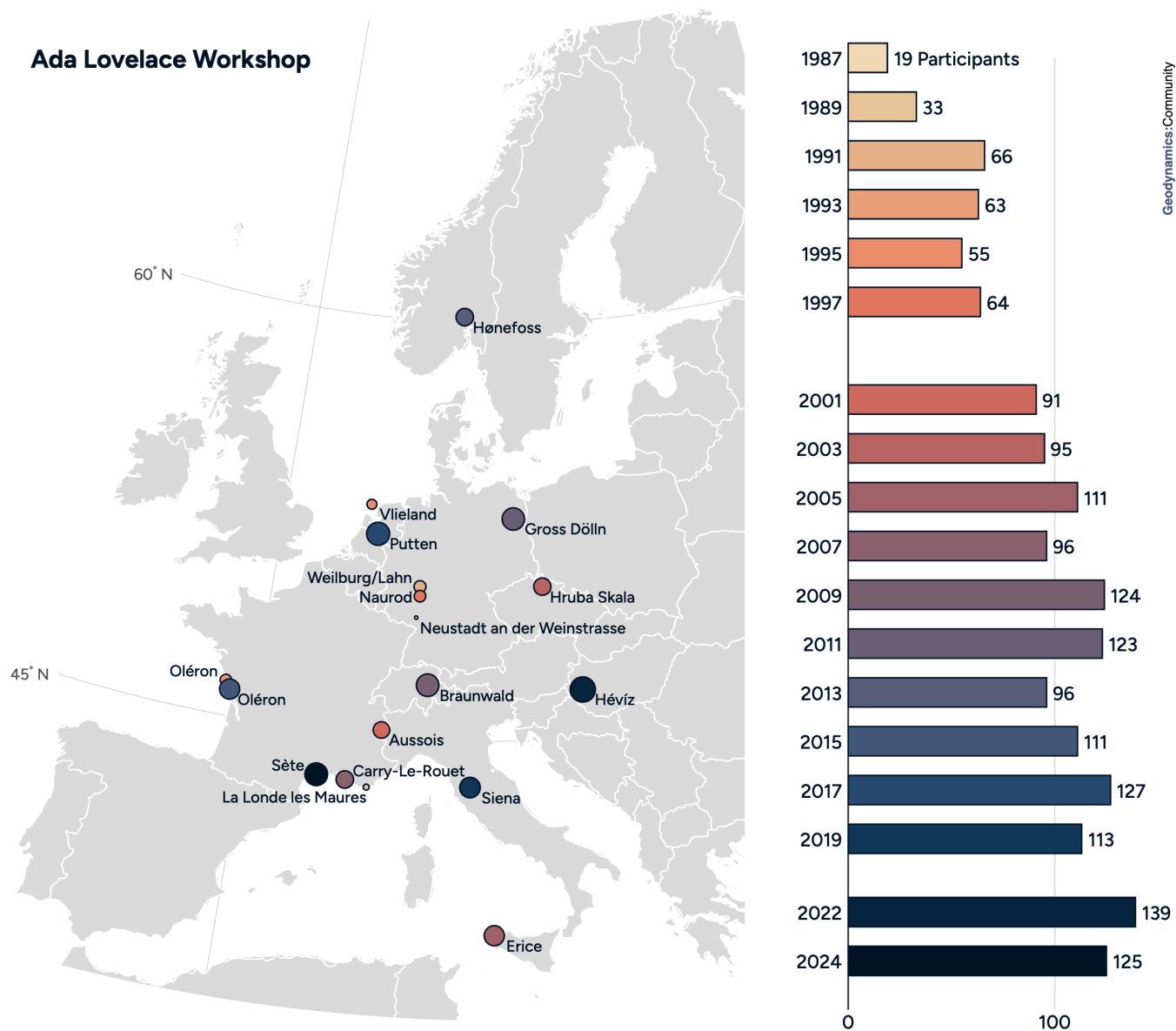


Figure 1. Left: The locations of the Ada Lovelace workshop from 1987–2024 indicated by circles. Circle size represents the number of participants, and circle colour represents the year the workshop took place (ranging from lighter colours for earlier years to darker colours for later years). Right: The number of participants of each workshop, again coloured by year. We identified a total of 857 unique participants from all the analysed workshops.



Gender data is not available in the conference booklets. Therefore, participant gender was assigned based on our personal knowledge of the community as well as our biased assessment of participant names. Following Perez (2019), we here define ‘gender’ as the social meaning imposed upon the biological characteristics that determine whether an individual is male or female, i.e., women (and men) are treated in a certain way because they are *perceived* to be female (and male). This is a social — but not biological — construct that directly relates to the way in which people navigate the world and hence academia and the field of geodynamics. We acknowledge that gender is not binary and can be fluid, for instance over time. As such, we set out to collect data with a non-binary definition of gender. However, we did not encounter any specific statements or indications of genders outside the binary woman and man descriptors in the participants of the Ada Lovelace Workshop. We therefore only present binary gender (women/men) data in this study.

If participants obtained more than one PhD degree, we listed the defence year of the degree relevant to geodynamics (e.g., geology, geophysics, geodynamics). For non-academic participants with a professional role at the conference, such as support staff and industry professionals, we recorded the year of their highest degree obtained, if available. Although these individuals may not reflect the geodynamics community per se, we found less than a handful of such individuals listed over the years, so their inclusion is unlikely to skew our results. Using the recorded year participants obtained their highest degree, we split the workshop participants into the following career stage groups: (1) students, i.e., those who at the time of the workshop had not yet obtained their PhD; (2) early career scientists, i.e., scientists (excluding students) who in the year of the workshop, had received their highest educational degree less than 7 years before; (3) established scientists, i.e., those more than 7 years past obtaining their PhD at the time of the workshop.

To gain insight into where the researchers attending the Ada Lovelace Workshop come from, we recorded the current English name of their overarching affiliated institution (e.g., University of Oslo instead of The Centre for Earth Evolution and Dynamics, CEED) as well as the country this institution is located in using the standard ISO 3166-1 alpha-3 three-letter country codes. If multiple affiliations were listed for a participant in the conference booklet, we only used the primary affiliation. Before 1990, affiliations from the German Democratic Republic (DDR) were recorded as a separate country to those from the Federal Republic of Germany according to the geopolitical situation at the time.

We also recorded the contribution and roles of participants at the workshop, because the type of scientific contribution has implications for the visibility of the participants: an invited talk typically recognises previous significant work and may increase visibility in the community, whereas a poster recognises current contributions but may reach a smaller audience. In terms of contributions, we distinguish between (1) invited talk; (2) poster; and (3) no presentation. For conferences before 1995, we classify contributions as (4) talk and (5) short talk (not shown in our analysis), due to the different workshop format at the time. If participants had multiple contributions, we recorded the (invited) talk instead of the poster. Where specified, we also recorded the organisational role of each participant as (1) member of the Local Organising Committee (LOC); (2) member of the Scientific Organising Committee (SOC); (3) session chair (including discussion leader or facilitator); or (4) none.

All data were collected in a spreadsheet database and stored on the University of Edinburgh’s OneDrive. Note that we only present aggregated anonymous data in this study to comply with the European General Data Protection Regulation (GDPR) and ethical considerations (see the Ethical Statement for more details).



2.3.1 Missing, unavailable, or ambiguous data

Not all workshops recorded the same data or have records of their data available online. Where possible, we filled the gaps through online searches. For example, there is no booklet of the 1995 meeting published anywhere online. However, a summary of the workshop appeared in a blog post (King and Hansen, 1995), detailing the number of participants and the names of the speakers (although not of all the participants). Another example of missing data is the role people were assigned at the early workshops; there was no official scientific committee and chairs were not always specifically named. Similarly, the documents of the workshops in 1987, 1989, 1991, and 1993 lack information on the affiliation of the participants. We therefore listed the institution that a participant was at that year according to their publicly-available curriculum vitae, or — if a curriculum vitae could not be found — the listed affiliation of the (first) paper published by that participant in the year of the workshop. Before 1995, poster contributions were not listed, even though poster sessions were likely held spontaneously as noted in the correspondence surrounding the workshops at the time. If there were no poster sessions or if that information was missing, we indicate this with an ‘x’ in our figures — other missing data is similarly indicated in the figures. In terms of missing data, out of the 857 identified (i.e., excluding the unidentified participants from 1995) individual participants of all the workshops considered in our analysis (1987–2024), there were only 9 participants (1%) for which we could not establish the year they obtained their PhD and/or their affiliation. They are plotted as ‘unknowns’ in our figures.

Apart from the parameters mentioned above, we did not record any other information on the participants or the workshops themselves. While our resulting database is as comprehensive as possible, there are many other components to diversity, such as age, sexual orientation, ethnicity, nationality, and physical and mental ability that we do not consider in this study. These components require a prospective approach (i.e., collecting information before/at workshops from consenting participants directly) rather than the retrospective approach we take here.

Other factors that directly impact who participates in the Ada Lovelace workshops, such as costs and accessibility, were unfortunately not recorded continuously. We retrieved scattered workshop attendance costs from 2007 onwards (see Section 4.2), but otherwise do not consider these factors in our analysis. Similarly, there are only scarce records of travel grant awardees or early-career poster prize winners, so we cannot report on their potential effects on promoting diversity.

2.4 Analysis

To analyse the collected data, we developed a post-processing routine in MATLAB (shared in Crameri et al., 2026). The script reads in the data sheets, extracts the relevant numbers, and produces the publication-ready figures automatically and reproducibly. Based on output from the script, we iteratively unified participant names, as some participants used different versions of their name over time (e.g., ‘Bill’ versus ‘William’), changed their name over time (e.g., through marriage), or had their name misspelled. We manually selected one of these name variations for our database. To handle special characters in names, the script makes the following changes: (1) names with accents and special characters are adapted to easy-form machine readable letters, i.e., á to a; and (2) dashes in names are replaced with a space. Ensuring that all participants are



correctly identified despite these variations allows us to comment on the total number of identified individual participants
 205 (857) and repeat attendance of the workshop (Section 4.1).

The script performs consistency checks on the data to ensure all countries of affiliation in the database exist. The countries are then grouped into continents based on the classification from the World Population Review (2026). To handle minor overlaps of countries between continents, the script considers Turkey and Russia as part of Europe. The DDR, which is no longer part of the country classification, is also assigned to Europe.

210 After the above processing of the raw data, the script extracts aggregated anonymous numbers for all relevant groups, such as ECS, and subgroups, such as women among ECS. Subsequently, these group numbers are plotted over time. We use the resulting aggregated anonymous numbers to plot the conference data against one another, instead of against conference year, to investigate potential correlations between, for example, the number of invited ECS speakers and the number of ECS on the LOC or SOC. We then use the MATLAB *corr* function to perform the formal statistical analysis and calculate Pearson
 215 correlations. We only consider correlations significant if their p -value is lower than 0.05 (i.e., there is a smaller than 5% chance that the null hypothesis that there is no correlation is true), and report the Pearson correlation coefficient R . Note that in this analysis, we include data from 1995, where only 56% of the participants have been identified. This means, for example, that the percentage of ECS among the identified participants is included, but we cannot compute correlations with the percentage of ECS on the SOC, because the members of the SOC were not identified.

220 Using the MATLAB figure-making routine DiVA (Crameri, 2020), we apply the scientific colour map ‘lipari’ (Crameri, 2018; Crameri et al., 2024) to make the graphics accessible for variable colour vision and in black and white prints.

3 Results

As described in Section 2.2, the Ada Lovelace Workshop has changed topic, format, and location over the years, with participant numbers varying from 19 to 139. In the following, we describe how diverse this group of people has been in terms of gender,
 225 career stage, affiliations, and conference contributions, and we explore correlations between these attributes.

3.1 Gender diversity

The participation and contribution of women scientists to the Ada Lovelace Workshop have evolved significantly since its inception (Figure 2a). Overall, the percentage of women participants has increased with time, both collectively and across the individual career stages (Figure 2b). In 2001, the percentage of women surpassed 20% for the first time and then consistently
 230 remained above that number in subsequent years. This increase coincides with 2001 being the first year the total participant number increased from below 70 to more than 90 and a change in format with oral presentations becoming invite-only (see Section 2.2). The maximum percentage of women participation, 37.4%, was reached in Hungary in 2022.

The percentage of women is consistently higher among students and early-career scientists than among established scientists (Figure 2b). The percentages of women among students, ECS, and established scientists were roughly equal only in 2003
 235 and 2017. Although the percentage of women among established scientists has overall increased since 1997, it strongly varies

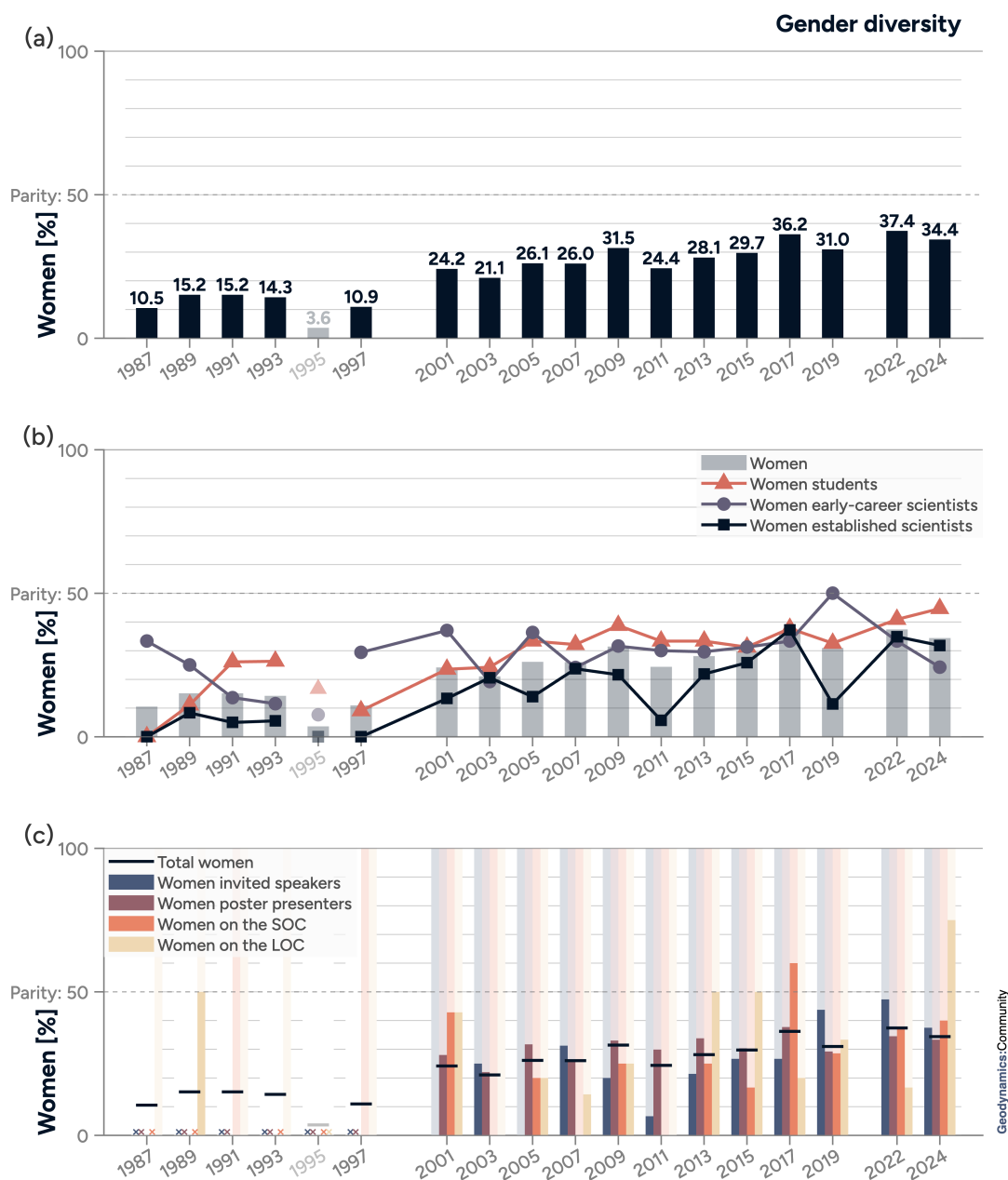


Figure 2. Gender diversity of the participants of the Ada Lovelace Workshop over the years. (a) Percentage of women participants over time. (b) Women participation data broken down by career stage, specifically, the percentage of women among participating students, early-career scientists, and established scientists. (c) The percentage of women among invited speakers, poster presenters, and members of the Scientific Organising Committee (SOC) and Local Organising Committee (LOC). Transparent background colour bars represent available data, whereas crosses and white background bars indicate that no data is available. Note that statistics on invited talks only start in 1995, since in earlier years all contributions were talks, with no difference between invited/keynote talks and other contributions. For 1997, the information on conference contribution is largely incomplete. We therefore only show invited and poster contributions from 2001 onwards. Also note that we were not able to recover participant names (and hence gender) of almost 50% of the participants in 1995. As such, the percentage of women in that year is most likely misrepresented and hence greyed out. Gender parity (Table 1) is highlighted by the dashed line at 50%.



between workshops. In some years, it reflects the percentage of women among all participants, while in other years the percentage of women among established researchers is less than half of that value. Some of those latter years (e.g., 2011) see fewer women giving invited talks or being part of the organising committees as well (Figure 2c). This pattern is consistent with broader participation trends: the percentage of women on the SOC and LOC is positively correlated with the overall percentage of women participants ($R = 0.75$ and $R = 0.53$, respectively; Figures 3a (identical to S4a) and S5a) and also with the percentage of women among established scientists ($R = 0.65$ and $R = 0.51$; Figures S4b and S5b) and women among ECS ($R = 0.69$ and $R = 0.50$; Figures 3b (identical to S4c) and S5c). However, we find no statistically significant correlation between SOC or LOC composition and the proportion of women among invited speakers.

The percentage of women among invited speakers varies substantially, in particular before 2013 (Figure 2c), from years without any women speakers (2001, 2005) to years where the percentage of women among speakers was larger than the overall percentage of women, reaching almost 50% in 2019 and 2022. This variability is strongly correlated with the overall percentage of women at the conference ($R = 0.71$, Figure S2d). In line with this, the percentage of women among established scientists and the percentage of women among ECS are positively correlated with the percentage of invited talks by women ($R = 0.72$ and $R = 0.60$, respectively; Figures S3b, S3c). On the one hand, these correlations likely reflect the broader trend of increasing participation by women over time. It may also be influenced by the relatively small size of the workshops: with 20 – 50 women participants and 15 invited speakers, the gender balance among invited speakers can substantially affect the overall gender balance of participants, and especially that of established scientists. On the other hand, workshops featuring more women speakers attracted more women participants. However, a higher fraction of women invited speakers does not always coincide with improved representation of women among established scientists relative to the overall participant group. Indeed, some years with a higher number of women invited speakers (such as 2019) still show a pronounced under-representation of women among established participants.

Since 2001, the percentage of women among poster presenters is similar to the overall percentage of women at a given conference. This is not surprising, as most presentations are poster presentations. In the early 2000s, the percentage of women among poster presenters exceeded the total percentage of women participants; from 2019 onwards, this percentage is lower than the total percentage of women participants. This corresponds to a higher percentage of women among invited speakers.

Before 2013, the Ada Lovelace Workshops generally show the same percentage of women (including zero) in their respective LOC and the SOC, except for 2007. Note that in 1997, 2001, and 2005 the LOC and SOC consisted of the same people. After 2011, the percentage of women in the LOC and SOC differs up to a factor of three, but both committees consistently include women.

3.2 Career stage diversity

Students and early-career scientists combined consistently make up the majority of the participants of the Ada Lovelace Workshop (Figure 4). Over time, student participation has increased: whereas students made up about 30% of participants in 1987, they represented 40 – 50% of the participants at workshops from 2009 onwards, with the exception of 2013 and 2024.

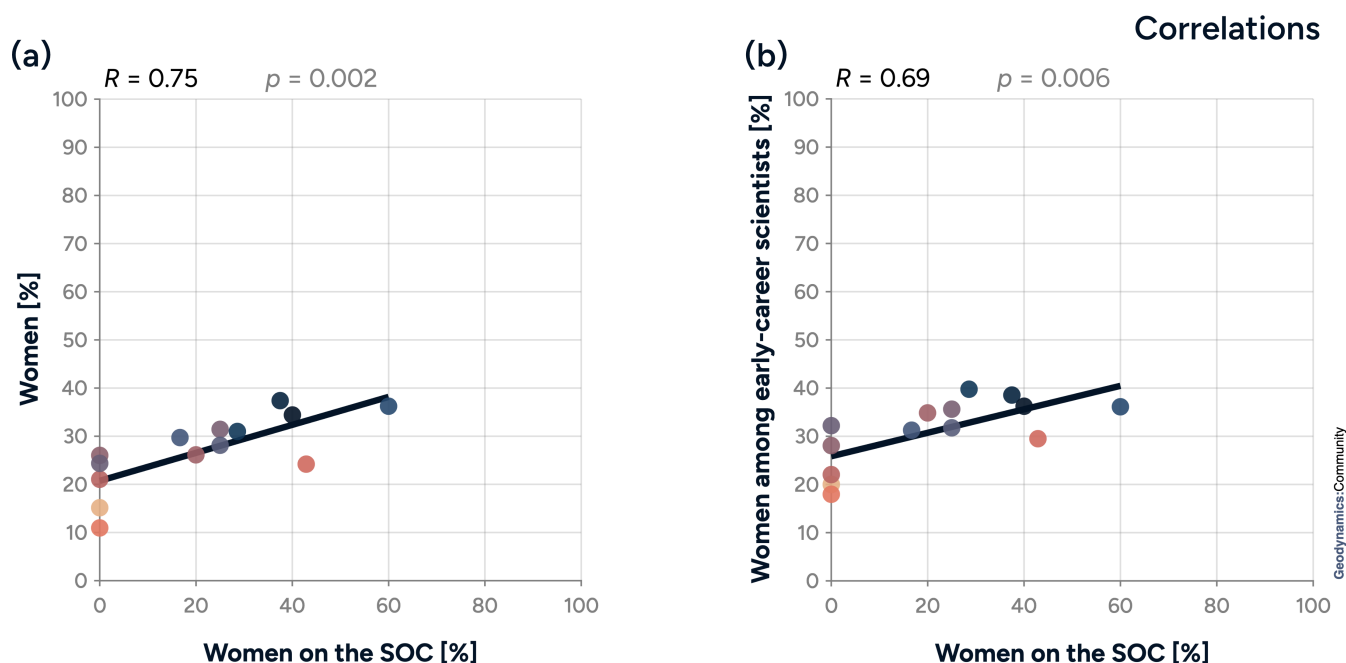


Figure 3. Relationship between the percentage of women on the Scientific Organising Committee (SOC) and (a) the total percentage of women participants at the conference; and (b) the percentage of women among early career scientists from early (light colours) to recent (dark colours) workshops. The colour scale is the same as in Figure 1. Note that we show the correlation plots for all the statistically significant (p -value < 0.05) relationships we found in our data in the Supplementary Material. As such, panels (a) and (b) are reproduced there as Figures S4a and S4c, respectively.

Figure 4b shows the scientific contributions of students and ECS combined. With the exception of the years 2007 and 2019, in which ECS constituted more than 50% of invited speakers, in general, over 2/3 of the invited speakers are established researchers. This reflects the fact that invited talks are given by researchers considered to have made a significant contribution in their fields, who are more likely to be established researchers by that point. With the exception of the first two conferences in 1987 and 1989, when PhD students initiated and organised the Ada Lovelace Workshop for the first time, students and ECS are generally under-represented in the LOC and, especially, the SOC compared to the total percentage of ECS. This is to be expected, as more established researchers have a wider scientific network, a better overview of their field, and more experience in organising conferences. Poster presentations by students and ECS consistently represent 60% or more of total posters in all years where data is available. This is consistent with students and ECS presenting preliminary or unfinished work, which is more suitable for a poster presentation.

Conferences with a low percentage of students and early-career scientists among invited speakers also feature a low percentage of women as invited speakers (although the correlation is not statistically significant). Furthermore, the percentage of women among participants is positively correlated with the percentage of ECS among participants ($R = 0.54$, Figure S2a). In

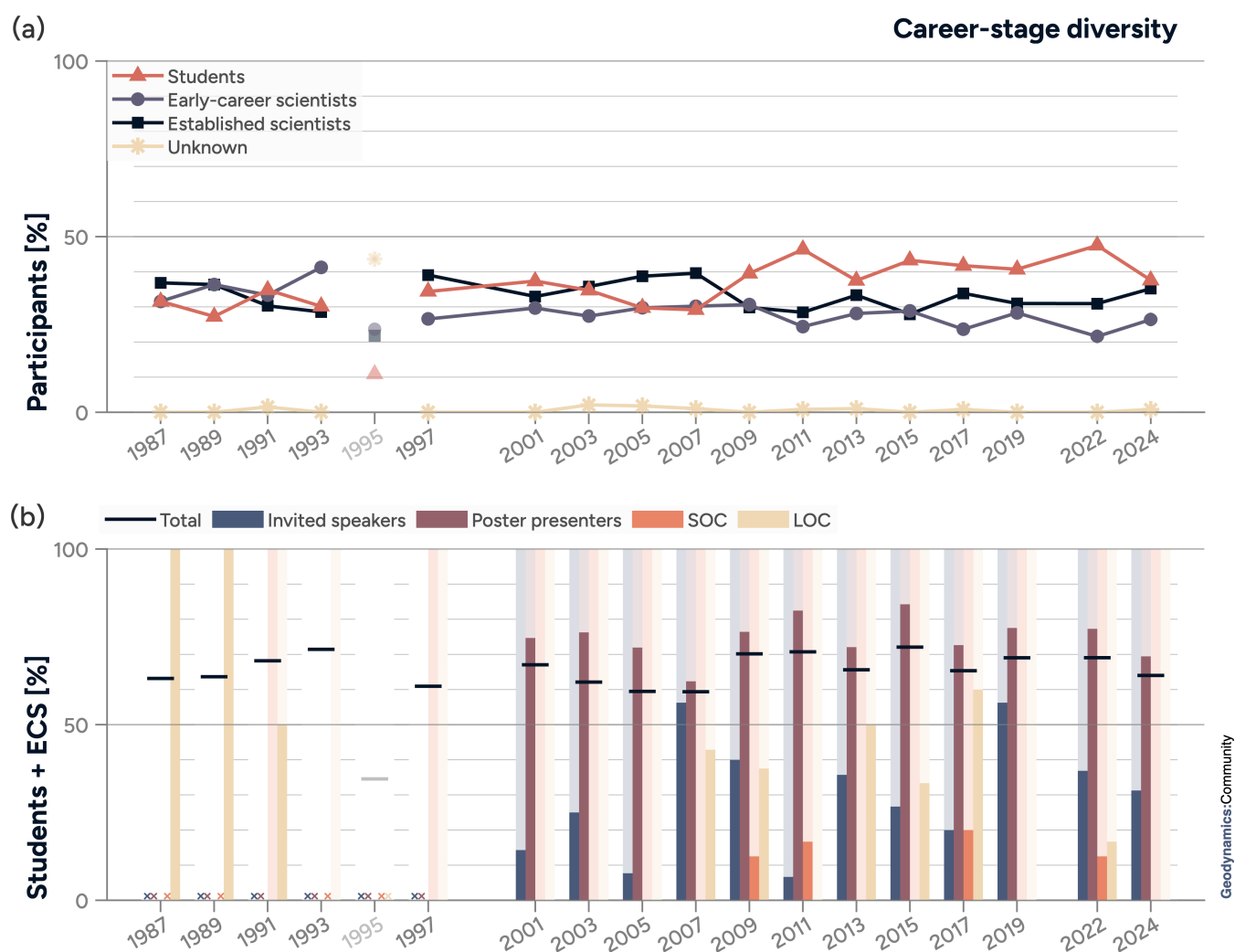


Figure 4. Career stage diversity of the participants of the Ada Lovelace Workshop over the years. (a) Percentage of students, early-career scientists (ECS), and established scientists over time. (b) The percentage of students plus ECS among invited speakers, poster presenters, and members of the Scientific Organising Committee (SOC) and Local Organising Committee (LOC). Transparent background colour bars represent available data, whereas crosses and white background bars indicate that no data is available. Similar to Figure 2, the year 1995 is greyed out due to a lack of data, and we only show invited speaker and poster presenter data from 2001 onwards reflecting data availability and a change in format of the workshop.



other words, conferences that did not feature larger diversity in career stage among the participants and invited speakers also did not in terms of gender.

3.3 Geographic diversity

285 Researchers with affiliations in Europe and North America were present at all workshops (Figure 5a). Participants affiliated with institutions in Asia were present at 15 out of the 18 workshops; participants from Oceania at 16. Researchers from institutions in South America and Africa were only present once; in 2013 and 2017, respectively. It should be noted that the continents are over-represented by economically-developed countries, with for example the continent Oceania being predominantly represented by participants from Australia.

290 The number of countries represented by the participants at each workshop varied between 12 and 19 since 1997 (Figure 5b), while earlier workshops saw 9 or 10 different countries of affiliation. The highest number of countries represented (19) was reached in 2022 in Hungary.

As expected, the number of (primary) affiliated institutions exceeds the number of affiliated countries (Figure 5b). Although this number does not show a monotonic increase, the general trend is an increase in the number of affiliations over the years. 295 Since 2013, consistently over 50 different primary affiliations were represented at each workshop, while the first meeting in 1987 counted 17 different primary affiliations, reflecting the smaller number of participants (19). The number of institution affiliations generally follows the same trend as the number of country affiliations after 2001, with the workshops in 2011 and 2015 being the exception. In 2011, an increase in country affiliations coincided with a decrease in institution affiliations; in 2015, the reverse occurred.

300 Figure 6 shows the distribution of primary affiliation countries represented at each of the 18 workshops. Participants from the host country are always among the top-3 of countries represented, except in 2017, 2019 and 2022. The difference between the number of participants from the most-represented country and the other two top-3 countries has become smaller since 2011. With the exception of four conferences, the USA has always been in the top-3 of most-represented countries, even though the conference has never been hosted there. Germany and France have been in the top-3 seventeen and ten times and have hosted 305 the conference four and five times, respectively. Although Germany did not host the workshop after 2011, it was the most-represented country of affiliation during the last five workshops. The large presence of Germany and France in the top-3 and the fact that they have hosted many workshops reflects the large geodynamic community in both countries, their relatively robust funding landscape, and the relatively short travel distance to these European workshops. The large participation of USA-based researchers could be driven by sufficient funding, particularly through initiatives such as the Computational Infrastructure 310 for Geodynamics (CIG), and the relocation of European researchers to the USA. Not all participants from Asia necessarily represent researchers travelling directly from Asia for the workshop. They might, for instance, have a short-term Europe-based research project (PhD visit) or internship that makes it easier to attend the Ada Lovelace Workshop.

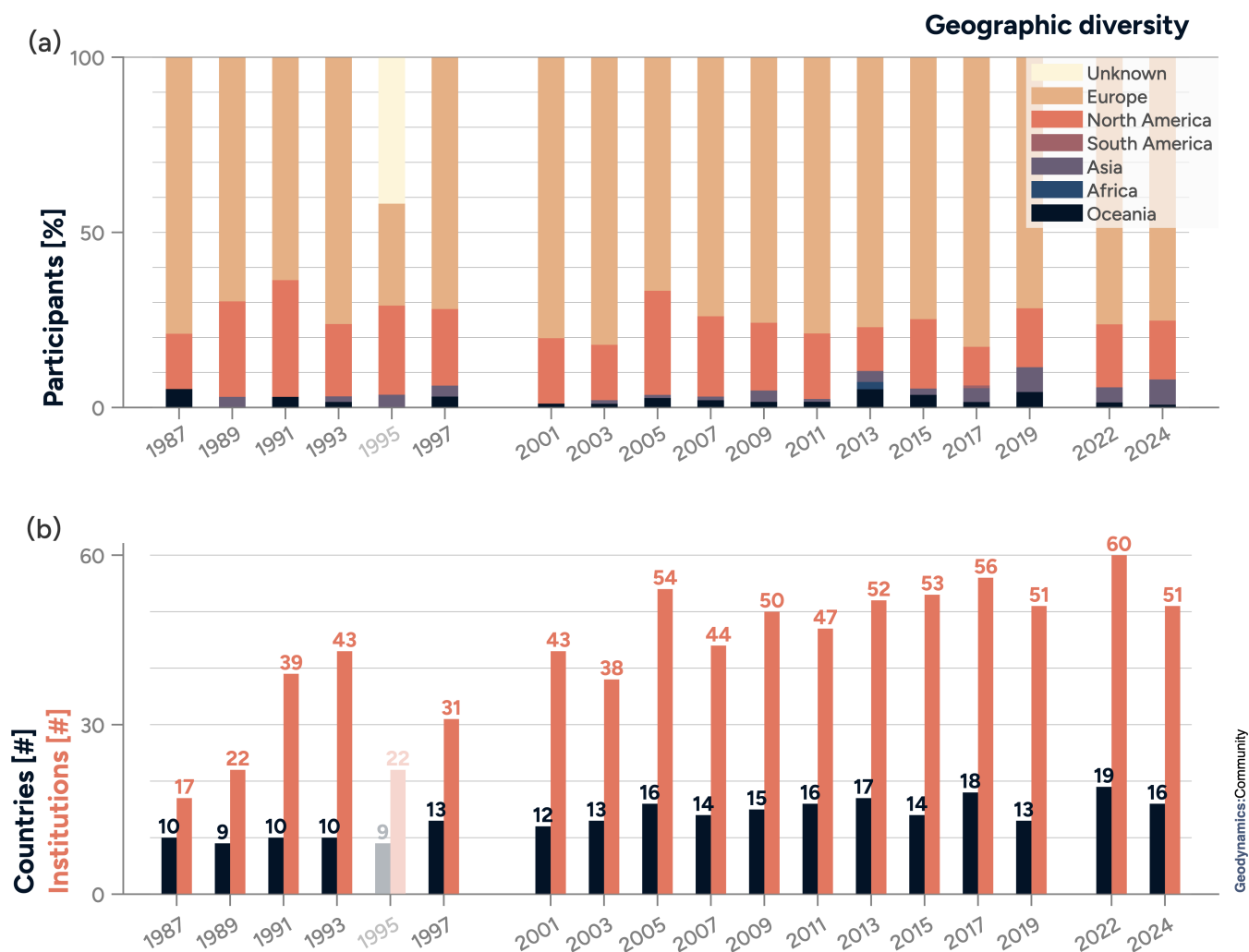


Figure 5. Geographic diversity of the participants of the Ada Lovelace Workshop over the years, based on the primary affiliation of each participant in the abstract books, programmes, and participant lists. (a) Percentage of participants from different continents. (b) Number of different primary affiliation countries (dark blue bars) and institutions (dark orange bars) represented by the participants.



Geographic diversity

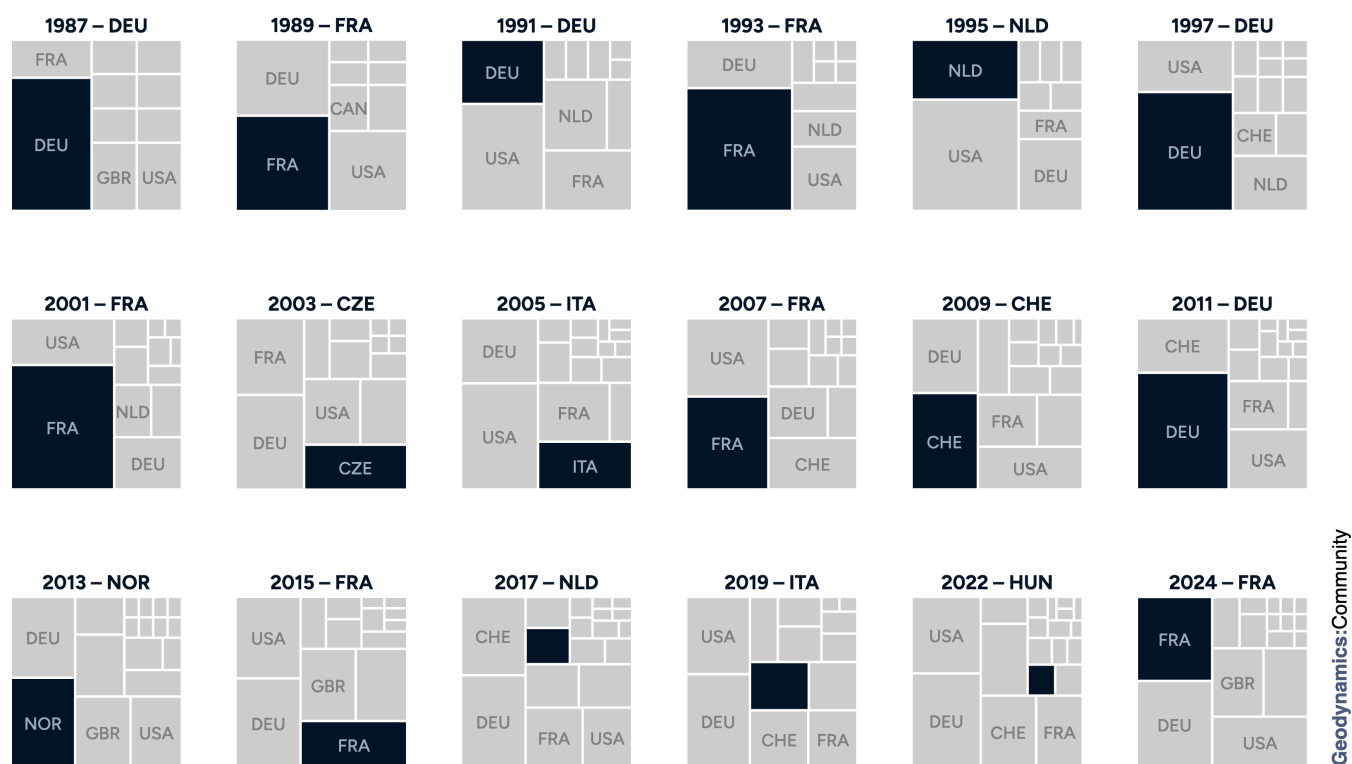


Figure 6. Distribution of primary affiliation countries represented at each Ada Lovelace Workshop. The size of the rectangles is proportional to the percentage of participants from a given country. The rectangle representing the host country (country code listed above the total square) has a darker colour. Country abbreviations follow the ISO 3166-1 alpha-3 country codes: CAN - Canada, CHE - Switzerland, CZE - Czechia, DEU - Germany, FRA - France, GBR - United Kingdom of Great Britain and Northern Ireland, HUN - Hungary, ITA - Italy, NLD - Kingdom of the Netherlands, NOR - Norway, USA - United States of America.

4 Discussion

Our data on Ada Lovelace Workshop participants shows that the diversity of the attendees has evolved over the years. In general, the workshop has seen increased participation of women and students, and increased country and institution representation. In this section, we first contextualise our results by assessing both repeat participation and the costs of attending the workshop. We then broaden the discussion to the diversity of geosciences and its subfields and how our results compare to statistics of the geosciences community as a whole, taking into account the limitations of our approach. Looking towards the future, we then predict the year in which gender balance of the participants could be achieved at the Ada Lovelace Workshop, how this timeline may be accelerated, and how other aspects of diversity may be increased through proactive measures that promote JEDI principles.

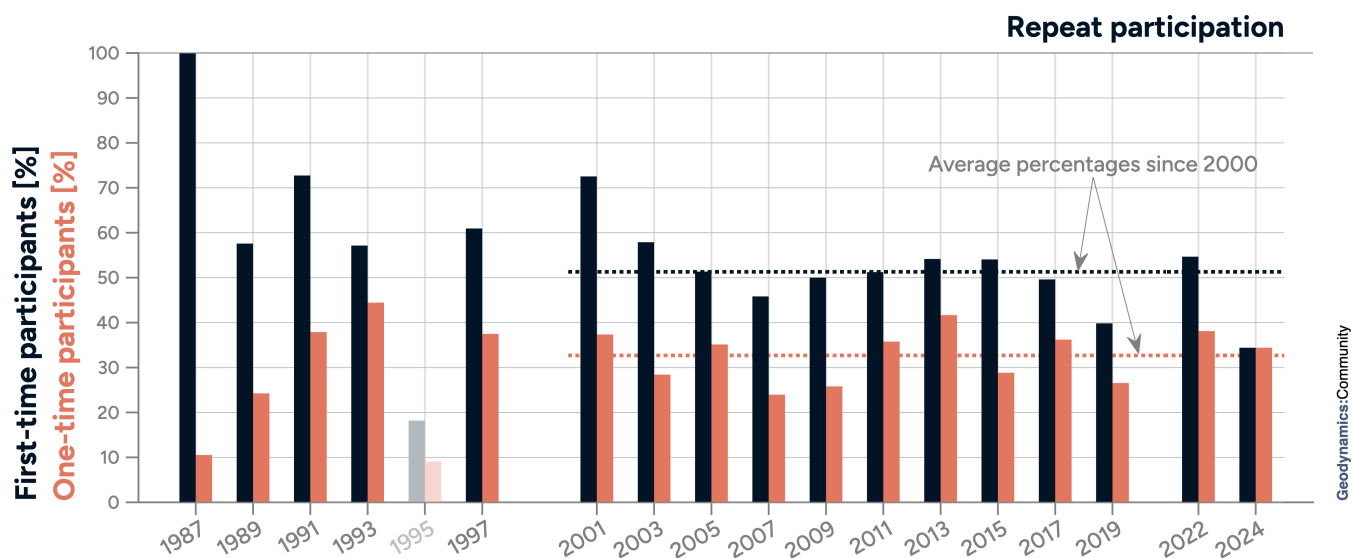


Figure 7. Percentage of participants attending the Ada Lovelace Workshop for the first (dark blue bars) and only (dark orange bars) time over the years. Dotted lines indicate the averages of these metrics in the 21st century.

4.1 Repeat participation in the Ada Lovelace Workshop

As shown in Figure 7, from 2001 to 2024, an average of 51% of participants at a given workshop edition had not attended the Ada Lovelace Workshop before, including about 33% of all participants who attended only once (that is, they did not return in subsequent years). At the same time, a core group of researchers attend the meeting regularly: out of the total 857 unique identified participants from 1987 to 2024, 63 participants (7.4%) attended the meeting at least 3 times; 35 participants (4.1%) at least 4 times; and 27 participants (3.2%) at least 5 times. These numbers likely reflect career trajectories; people who remain in research regularly attend the meeting, while early-career attendees who end up pursuing other career paths may participate only once or twice during their studies. For workshops after 2001, about 36% of first-time participants have attended a second workshop.

The percentage of one-time attendees is lowest at the very first workshop (excluding 1995, where our record is incomplete). This indicates that many of the initial attendees attended subsequent workshops and went on to have a longer-term career in geodynamics. After an initial increase in one-time participants over the first few workshops, this metric shows some variation, but no systematic trends over the last decades. These variations in repeat participation likely reflect changes in the participant number, given that the percentage of first-time attendees is generally, but not always, higher in years that have substantially more participants than the preceding workshop (e.g., 2001 and 2022, compare with Figure 1) and lower in years that have fewer participants than the preceding workshop (e.g., 2007, 2019, and 2024).

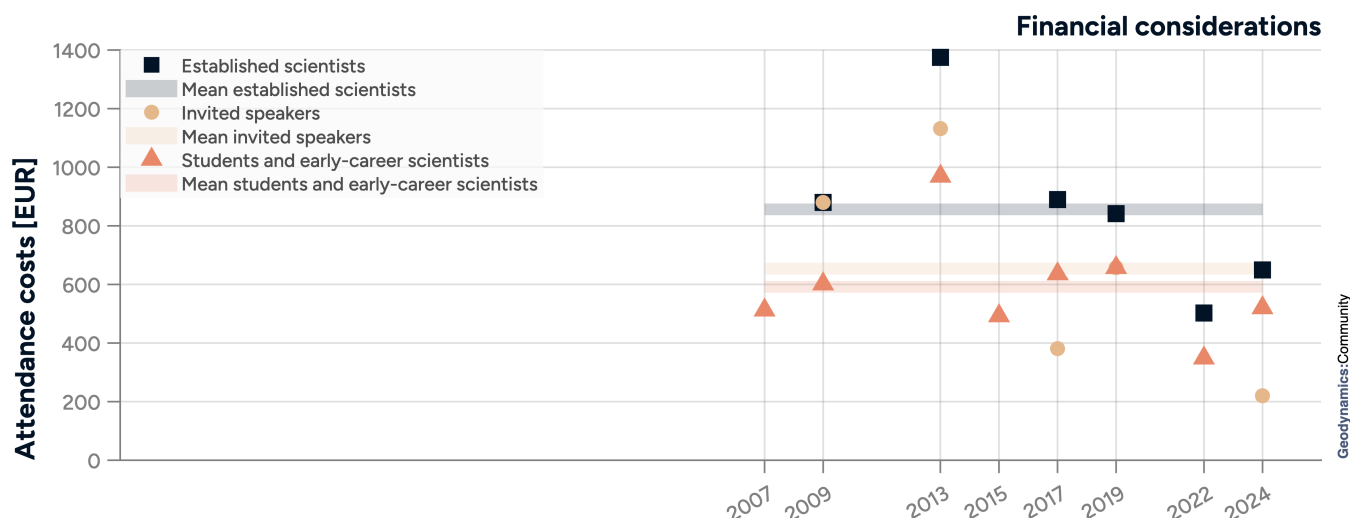


Figure 8. Ada Lovelace Workshop attendance costs consisting of registration and accommodation fees in euros (EUR) adjusted for inflation (normalised to the buying power in 2024). Note that the data on attendance costs is limited and mostly skewed to recent years; we only plot available data.

Hence, our data shows that there is a balance in experience at the Ada Lovelace Workshop, with about half of the participants being new to the workshop every edition and a returning core of participants familiar with the format and topics of the conference.

4.2 The costs of attending the Ada Lovelace Workshop

Higher costs and low venue accessibility could be barriers to conference participation, thereby limiting the diversity of people who can attend. Similarly, specific periods throughout the year could prove prohibitive due to clashes with, for example, caretaker duties. Here, we present the available data on the costs of attending the Ada Lovelace Workshop.

The attendance costs (registration and accommodation, Figure 8) are first converted to euros (EUR) using the exchange rate at the time of each workshop and then adjusted for inflation with respect to 2024 according to Webster (2026). In other words, costs are normalised to the buying power in 2024. On average, ECS costs are EUR 592, while senior participants pay EUR 856 for registration and accommodation. The workshop in Norway in 2013 stands out for being anomalously expensive, although organisers provided some financial support to early-career scientists. Conversely, the workshop in Hungary in 2022 was a relatively cheap workshop to attend. This may reflect the difference in the cost of living in both countries. These two cost outliers inversely relate to the number of participants, with the 2013 workshop in Norway having a relatively low number of participants (96) and the 2022 workshop in Hungary attracting 139 participants. Interestingly, the workshop in Hungary also shows the largest geographic diversity, with most countries (19) and institutions (61) represented, and the largest percentage of student participation. This suggests that lower financial barriers to attendance indeed have the potential to increase the diversity of conference attendees.



4.3 Limitations of our approach

Before discussing how the diversity of the geodynamics community compares to other geoscience subfields in Section 4.4, it is useful to (re)examine the limitations of our approach. One of the biggest assumptions in our interpretation of the data is that the participants of the Ada Lovelace Workshop are a fair representation of the whole geodynamics community. However, there are general, significant challenges in interpreting conference participation data (Sugimoto and Larivière, 2023), as financial factors, personal circumstances, and professional availability impact researchers' opportunities to attend conferences unevenly. As such, at any one time, only a subset of the research community is represented at conferences. Therefore, we caution that the interpretation of our results on the diversity of the geodynamics community needs to be viewed with these factors in mind. While it is true that we, as authors and active participants of the Ada Lovelace Workshop, consider the workshop to be a reasonable snapshot of the community, it is not the only place where geodynamicists congregate. There is, for example, considerable overlap between the scientific themes and communities of the attendees of the Ada Lovelace Workshop and the similarly biannual, alternating conference GeoMod, which focuses on modelling geoscience processes. In addition, the Geodynamics Division of the European Geosciences Union provides perhaps the most clear definition of the geodynamics community through self-selection of participants in their abstract submissions. However, data from the EGU General Assembly is difficult to obtain and due to the interdisciplinary nature of geodynamics research, self-identified geodynamicists might find themselves in the sessions of other divisions at the EGU General Assembly. Focusing our analysis on the Ada Lovelace Workshop as a proxy for the geodynamics community therefore seems a good first step towards analysing the diversity of the geodynamics community. In addition, the longevity of this conference allows us to look at the evolution of the diversity of the community over forty years, whereas the EGU General Assembly, for example, has taken place only since 2001.

Another large caveat of our approach is that while we are able to analyse the diversity of conference attendance in the geodynamics community, we cannot comment on the diversity of the community in aspects such as authorship and research impact, which are traditionally viewed as success factors in academic careers. Assessing how conference attendance translates to authorship and impact is difficult and out of the scope of this study.

Concerning our data and sample size of participants at the Ada Lovelace Workshop, it is important to note that the low participant numbers early in the workshop series limit the robustness of our statistics. We also reiterate that our gender data is binary, as our data collection search did not reveal any non-binary participants. We are not able to distinguish between cis- and transgender participants. If detailed gender data becomes available in the future, quantifying this metric would demonstrate the true diversity of genders in the geodynamics community.

Our results on geographic diversity need to be interpreted with the limitation in mind that we only consider the primary affiliation of each participant. This means that we potentially miss out on additional countries or affiliations represented. However, the vast majority of participants only list one affiliation, so this assumption is unlikely to affect our general conclusions.

Due to the limited available data, we also cannot comment on important diversity factors such as ethnicity, sexual orientation, and disabilities. We hope that future studies can look into these other factors, facilitated perhaps by automatically including an



optional demographic questionnaire during conference registration where participants can consent to their data being used for statistics and future JEDI studies.

Lastly, an important JEDI concept that is only briefly discussed here, is that of *intersectionality*: the concept that various aspects of a person's identity can overlap and intersect to create complex combinations of discrimination and privilege (Table 1). For example, a black woman will face different challenges than a white woman, although both have the same gender (e.g., Davis, 1981). Aspects of their gender identity, ethnicity, or socio-economic background intersect to create different, unique positions in society, despite both being women. Since we do not have data on, for example, the ethnicity of participants, we cannot assess intersectionality effects in depth.

4.4 The diversity of the geodynamics community within geosciences

Our study adds quantitative information on the diversity of conference attendees in the geodynamics community to the growing literature on the diversity of different subfields in geosciences and of geosciences as a whole.

Traditionally, the geosciences are among the least diverse disciplines in STEM, with Huntoon and Lane (2007) reporting that the percentage of Bachelor's and Master's degrees awarded to members of racial and ethnic minority groups between 1995 and 2001 was lower in the geosciences than in other STEM fields. At PhD level, Bernard and Cooperdock (2018) conclude that there has been no significant progress in the number of PhD students from under-represented ethnic and racial minorities in geosciences over the past four decades in the United States of America (USA). Indeed, they show that in 2016, 86% of PhD students in the USA identified as non-Hispanic white people, while only 61% of the USA population identified as such, demonstrating the over-representation of non-Hispanic white people in the awardees of geoscience doctorates. Geoscience academia in the United Kingdom faces a similar lack of diversity, as reported by Dowe et al. (2021). Whereas 18.5% of 18–24-year-olds in the United Kingdom identified as Black, Asian or Minority Ethnic in the 2011 Census (Office for National Statistics, 2011), just 10.4% of geology postgraduate research students identified as such in the academic year 2018/2019 (Dowe et al., 2021). Although we cannot comment on ethnic and racial minorities from our data, like Bernard and Cooperdock (2018), we see a relatively stagnant (very low) percentage of participants with primary affiliations in countries in the Global South.

While the representation of ethnic and racial minorities in the USA has not improved, the number of women obtaining their PhDs in geosciences in the USA has steadily increased over the past forty years (Bernard and Cooperdock, 2018). Over a similar timescale, we see this increase in women participation reflected in our (predominantly European) data of the Ada Lovelace Workshop participants.

Looking specifically at conference attendance on smaller time scales, our results compare well to other studies on diversity of conference participants in geosciences. Over the past ten years, the percentage of women participants has hovered between 30% and 38%, which is similar to the reported percentages of women at the AGU Fall Meeting (38.9% of 23,000 participants in 2021; American Geophysical Union, 2022), EGU General Assembly (33%; approximately 20,000 participants; Toth et al., 2020), NWO NAC — Dutch Earth and Environmental Science Conference (41.1% women presenters on geology-related



topics; 500 participants generally; Verberne et al., 2026), and the EANA (30–45%; 150–250 participants; Noack et al., 2026) and MARID conferences (33%; less than 100 participants; Lefebvre and Bernhard, 2024).

We find that students and ECS consistently make up approximately two thirds of the attendees at the Ada Lovelace Workshop. Similarly, student attendance is generally high at the above-mentioned conferences (e.g., 63% students and ECS in 2024 at the EANA conference; 30% students (no further data on ECS) at the MARID conference; 58% of EGU General Assembly 2026 abstracts contributed by students and ECS; Noack et al., 2026; Lefebvre and Bernhard, 2024; European Geosciences Union, 2026a). This high number of students and ECS at conferences likely reflects that more people work in junior roles in academia than in established scientist roles.

Considering the small scale of the Ada Lovelace Workshop, it shows a relatively large geographic diversity with numerous countries represented in the affiliations of attendees. In the last ten years, the number of countries represented at the workshop varied between 13 and 19, compared to 125 countries represented at the EGU General Assembly in 2026 (noting that the EGU General Assembly has two orders of magnitude more attendees) and 52 countries represented at the European Planetary Science Congress in 2025 (with roughly 1200 participants). Generally, the conferences discussed here all show an increase in the number of countries represented over the years (e.g., Noack et al., 2026), as we see for the Ada Lovelace Workshop.

4.5 The diversity of the geodynamics community in the future

Decades of work in the sociology of science support the idea that minorities can bring change inside an existing structure, as long as they reach a certain critical mass (Yong, 2018). Setting aside the controversy about the exact percentage of this tipping point or what makes for a true tipping point (Milkoreit et al., 2018; Milkoreit, 2023), women participation numbers at the Ada Lovelace Workshop have consistently been between 30% and 38% for the past decade (Figure 2), which is above the percentage that has been suggested to lead to tipping points in social conventions (Centola et al., 2018). This means that there is a critical mass for meaningful, actionable change in geodynamics, at least for gender equality, and indicates that the geodynamics community as a whole could move towards equal participation of women in the future. A tipping point such as the one for gender participation in the geodynamics community has not yet been reached for participation of scientists from the Global South according to our workshop data, indicating that representative participation of Global South scientists will follow a longer timeline. Indeed, since the Ada Lovelace Workshop host countries are inherently European and therefore by definition do not contain scientists (primarily) affiliated with institutions in the Global South, a critical mass to reach such a tipping point for participation of scientists from the Global South may be difficult to obtain.

4.5.1 Prediction of future gender balance at the Ada Lovelace Workshop

To extend the past trend of gender diversity into the future, we perform a least squares regression, modelling the percentage of women participants as a linear function of time in years. We omit the year 1995, because the data for that year is incomplete. Therefore, the analysis is performed on a data set with only 17 data points. The linear fit is then linearly extrapolated to predict the year in which the Ada Lovelace Workshop is expected to have 40% women in attendance to reflect the start of gender balance in the participants and the year in which it is expected to have gender parity (50% women, Table 1).

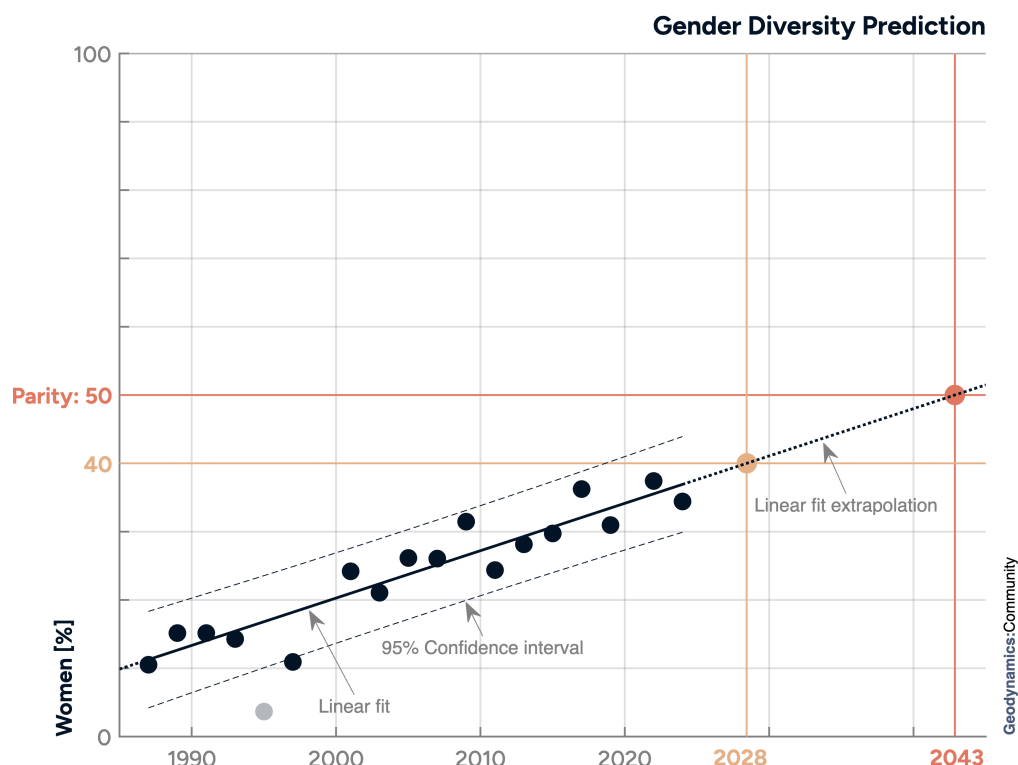


Figure 9. Gender diversity prediction for the Ada Lovelace Workshop. Gender balance (defined to be 40% to 60% women participation; see Table 1) is highlighted by the light orange line. Gender parity (Table 1) is highlighted by the dark orange line at 50%. Data from the 1995 workshop (light grey dot) is omitted from the data fit, as the gender of a large part of the workshop participants is unknown.

At the current rate of increasing women attendance, we predict that gender balance will be achieved by 2028 and gender parity by 2043. It is worth noting that 2037 will mark the 50th anniversary of the Ada Lovelace Workshop, so gender parity in the attendees will likely be reached more than 50 years after its inception. This is faster than the prediction made by Ermert et al. (2023), who estimated that gender parity in first-authorship in seismology will be reached between 2078 and 2112. Although the timelines to reach gender balance in these geophysical communities might seem long, this increase in women participation outpaces the general societal trend. According to the World Economic Forum, the gender gap will only be closed by 2158 (five generations from now; Pal et al., 2024), although this pertains to equal pay and reward as well as equal participation.

4.5.2 Accelerating diverse participation at small conferences

To accelerate the timelines towards representative participation, measures need to be taken at personal, institutional, and community levels. Here, we provide examples of measures that could be taken by institutions and the community during the organisation of a conference. Biggs et al. (2018) note that “conferences signal the norms of a discipline” and — as shown in Section 4.1 — conference attendees consist of a stable core of established scientists that regularly attend specific events. As



such, conference organisers as well as participants can play a vital role in both increasing and retaining diverse participation in their field through (1) increasing the visibility of diversity at the conference; (2) improving the conference's ambience; (3) reducing the financial costs of attending; and (4) collecting, analysing and acting upon diversity data.

470 To increase the visibility of a diverse community at small conferences, Lefebvre and Bernhard (2024) suggest to invite speakers and chairs varying in gender, affiliation, sexual orientation, ethnicity, ability, socio-economic background, and career stage. Inviting speakers well in advance can also help the speakers plan around caretaker duties (Corona-Sobrino et al., 2020). Organisers can mitigate the fact that women more often decline speaker invitations than men by inviting them first (Corona-Sobrino et al., 2020). Speaker choices are often guided by implicit biases (Ford et al., 2018); initiatives where scientists self-
 475 identify can help broaden organisers' networks of potential invited speakers (e.g., Pérez-Díaz and van Zelst, 2020; 500 Queer Scientists, 2026; 500 Women Scientists, 2026; Macosko and Barham, 2023; Institute of Science and Technology Austria, 2026). In addition, including women, ECS, and other minorities in the LOC and SOC can lead to more diversity of the conference as a whole (e.g., Corona-Sobrino et al., 2020; Biggs et al., 2018, and Figure 3), although it also increases the workload of these individuals. Session chairs can also be instructed to prioritise questions from women and students (Lefebvre and Bernhard,
 480 2024; Verberne et al., 2026). For example, Salem et al. (2021) show that if a woman asks the opening question, more women ask questions afterwards. At the Ada Lovelace Workshop, the ECS hour successfully provides a chance for students and ECS to interact with the speakers without more senior participants present. This could be supplemented with anonymous question asking (e.g., via Slido or Mentimeter presentations; Cisco Systems, Inc., 2026; Mentimeter, 2026) to further reduce barriers to asking questions. Awarding prizes for outstanding contributions to diverse recipients (Lefebvre and Bernhard, 2024) highlights
 485 the attendees' work and boosts morale. Publishing awardee names and affiliations provides long-lasting recognition, e.g., on the conference website like that of the Ada Lovelace Workshop in 2024 (Thoraval and Garel, 2024). Awards do not need to be restricted to posters and talks, but could also be awarded for outstanding software development or outreach activities to ensure a breadth of skills is acknowledged.

A constructive and welcoming conference environment is created by all participants (Verberne et al., 2026), but Lefebvre
 490 and Bernhard (2024) stress that organisers and conveners lead by example when addressing speakers. As authors, we think that in addition to how participants react to scientific contributions, it can also be fostered by normalising alcohol-free activities (e.g., Dowey et al., 2021), accessibility measures, and catering for dietary requirements and preferences. Offering a variety of social activities, a quiet room, childcare options, and accommodation for childcare persons makes participation more accessible, as does choosing a location with easy transport options. The organisers can also support and fund JEDI-activities
 495 during the conference (Fernando and Dryák-Vallies, 2025) and create name badges that include self-selected pronouns. These measures signal that everyone is welcome (e.g., Biggs et al., 2018). Agreeing to a code of conduct during registration clearly explains participants' rights and duties at the workshop (e.g., ADVANCEGeo Partnership, 2018; Computational Infrastructure for Geodynamics, 2023; Rocky Worlds 4, 2025; Fernando and Dryák-Vallies, 2025). Dedicated ombudspople for the conference can be listed in this code as points of contact. Finally, clearly communicating what participants can expect (e.g., there are
 500 alcohol-free options; there will be designated toilet stops during field trips) promotes both inclusivity and accessibility.



The financial costs of attending a conference can prevent people from participating (see also Section 4.2). Scientists from, e.g., Eastern Europe and the Global South receive less funding (Valkárová, 2023), which can translate to less means for travel. Lefebvre and Bernhard (2024) propose student travel grants awarded through a competitive process that also provides proposal writing experience. Specific funding for minority students is recommended by Bernard and Cooperdock (2018). In addition, we propose reduced fees for participants from lower-income countries, although this does not guarantee sustained participation, which probably requires dedicated long-term community-level support. Remote attendance leads to a different experience of a small conference, but could provide a cheaper, travel-free option. As our data shows (e.g., compare Figure 8 with Figures 1 and 4), cheaper conferences attract more students, and therefore show more gender and career-stage diversity. Registration for a select number of days or offering a hybrid conference experience could also reduce costs and help with scheduling around caretaker duties (Corona-Sobrino et al., 2020). Fernando and Dryák-Vallies (2025) also suggest waiving fees and single-abstract submission rules for JEDI-contributions (e.g., the General Assembly of EGU allows for submitting a second first-author abstract in JEDI and education and outreach sessions).

Data on conference diversity is difficult to obtain using the retrospective approach we took here. We propose that a proactive, anticipatory approach — by asking conference participants during registration for their data and approval of its usage for JEDI analysis — helps with (1) conference organisation (e.g., dietary requirements, wheelchair access, a quiet room); and (2) analysing and, where needed, improving the conference’s diversity in the future. Lefebvre and Bernhard (2024) also advise to present this data, anonymised, during the conference. Tracking diversity data over several years can show the pay-off of organisational efforts to improve diversity for all, with specific evaluation tools to monitor gender diversity developed by, for example, Corona-Sobrino et al. (2020). We strongly encourage discussing such data collection and analysis up front with the organising institution’s experts on data protection and ethical and legal aspects (see our Ethical Statement for more details).

5 Conclusions

The Ada Lovelace Workshop took place 18 times from 1987 (the year of its inception) to 2024, with participant numbers varying from 19 at the first meeting to well over 100 in the past ten years. During these roughly forty years of geodynamic science, the diversity of the participants attending this European conference has changed significantly.

Our data clearly shows that: (1) the percentage of women in computational geodynamics has increased in the past four decades across career levels; (2) the current percentage of women attending the Ada Lovelace Workshop aligns with the percentage of women participating in other geosciences conferences; (3) the amount of different primary country and institution affiliations represented by participants has increased; (4) the percentage of participants with primary affiliations from the Global South is low and has remained stagnant; and (5) student participation has increased. This reflects trends previously observed in global and regional data on conference attendance, authorship, and the composition of the workforce in geosciences and its subfields.

The data further shows that increasing the number of women on the Ada Lovelace Workshop SOC does not correlate with the number of women invited speakers, despite the fact that SOC-members can directly influence this number. However, there



is a positive, statistically significant correlation between the percentage of women on the SOC and the percentage of women attending the meeting overall. We also found that conference editions with more students and ECS, and hence a larger diversity in career stage, featured a larger proportion of women participants. As such, our results support the interpretation that a gender-balanced SOC and the (re-)introduction of ECS on the SOC foster a more inclusive environment and therefore more diversity in its participants.

Our analysis of the available information on conference attendance costs shows that the cheapest workshop to attend attracted the largest geographic diversity of participants and the largest percentage of student participation. This could indicate that removing financial barriers to conference participation can increase the diversity of conference attendees.

Looking towards the future, we predict that the participants of the Ada Lovelace Workshop could reach gender balance within the next couple of years and gender parity by 2043, if the increase in women participation continues at the current rate. This is faster than similar predictions on, for example, gender equality in first-authorship in the related field of seismology (Ermert et al., 2023).

Major efforts are still required concerning the inclusion of scientists from diverse geographical locations, in particular the Global South. However, overall, the geodynamics community, as proxied by the attendees of the Ada Lovelace Workshop, has shown an increase in diversity regarding women and student participation and country and affiliation representation. Future studies could comment on other aspects of diversity in the geodynamics community that we were not able to analyse here, such as ethnicity, race, and different abilities. We as authors hope that the geodynamics community continues to increase its diversity, inclusivity, and equity, perhaps by implementing some or all of the proposed acceleration measures here. This way, we can produce just, creative, and innovative solutions to the many mysteries of Earth's dynamics.

Ethical statement. Although the data used in this study is publicly available, it is still (identifiable) personal data. We are therefore required to follow the General Data Protection Regulation (GDPR) according to European Law. In order to ensure we adhere to the GDPR, we followed the guidelines from the University of Edinburgh and made a Data Management Plan (DMP, approved in April 2025 by the University of Edinburgh) and Data Protection Impact Assessment (DPIA, approved in May 2025 by the University of Edinburgh). To notify the subjects of the study (i.e., the participants of the Ada Lovelace Workshop from 1987 to 2024), we distributed a Participant Information Sheet (PIS, approved in April 2025 by the University of Edinburgh; modified to a final version in November 2025 on the recommendation of the Research Ethics and Integrity committee of the School of GeoSciences at the University of Edinburgh) and Information Obligation (approved in April 2025 by GFZ) to the community via (1) a blog post on the EGU Geodynamics blog (*Notice! Your public data has been collected to study the diversity of the geodynamics community over time*; originally published in April 2025; updated in November 2025 with the final version of the PIS; Van Zelst, 2025); (2) a post on the Computational Infrastructure for Geodynamics (CIG) forum in April 2025 and a new reply in November 2025 to update the PIS (Glerum, 2025); (3) a message from the main organiser of the 2024 Ada Lovelace Workshop, Fanny Garel, to the participants of the most recent workshop in April 2025; and (4) two messages to the EGU Geodynamics mailing list — one in April 2025 and one in June 2026.

Consulting with the legal team of the University of Edinburgh, it was established that we do not require an International Data Transfer Agreement (IDTA), since all the recipients (i.e., the co-authors of this study) of the UK-based data are based in EEA countries and countries



with an adequate level of protection (Switzerland). However, since this project concerns (identifiable) personal data, we consulted with the legal offices of all our six institutions and, led by the legal office of the University of Edinburgh, we signed a Data Sharing Agreement on 8 June 2026 with a listed start date of the project of 6 May 2024.

The data come primarily from the publicly online available abstract books and participants lists archived primarily by Gregor Golabek, who mentioned that “to [his] knowledge anybody can use [this] information” and has approved our use of the data (July 2025). We also note that this archive of information has been collected on the official German Geophysical Society (DGG) website since the 1990s, as the DGG has been one of the main sponsors of the Ada Lovelace Workshop. Similarly, recent Ada Lovelace Workshops have been sponsored by the European Geosciences Union (EGU), which has similarly archived information on its website (European Geosciences Union, 2026b).

We also reached out to the main organisers of the Ada Lovelace Workshops over the years (members from the Local Organising Committees and the Scientific Organising Committees) to ensure that they “*approve the use of the information contained in the abstract books and participants lists of the Ada Lovelace Workshops they (co-)organised for the purposes of the diversity in the geodynamics community study by Van Zelst et al.*”, as this is a different use of the data than originally intended when assembling these documents. Throughout July and August 2025, we received exclusively positive responses from the organisers, confirming that at least one of the organisers of each of the past workshops explicitly approves of our use of this data. Note that we were not able to reach all former organisers and/or get a reply from everyone.

Presenting all these considerations in our Research Ethics and Integrity Assessment Form, we obtained formal ethical approval from the Research Ethics and Integrity committee of the School of GeoSciences at the University of Edinburgh on 6 November 2025 to analyse, interpret, and write up our collected data from January 2026 onwards under the conditions of the Data Sharing Agreement signed by legal representatives from all participating institutions (8 June 2026).

Code and data availability. The data used in this study are publicly available online and (for the most part) easily findable using institutional profile pages, Google Scholar, LinkedIn, ORCID, and national theses databases. Our study collected and synthesised this information for the first time in a comprehensive database that encompasses Ada Lovelace Workshop participants from 1987 to 2024. Following the General Data Protection Regulation (GDPR) and best practices from the University of Edinburgh, we unfortunately cannot make this database publicly available, as it contains identifiable personal information. All data pertaining to this study are therefore stored in the University of Edinburgh’s DataVault [link to final archived repository will be made available upon acceptance of the manuscript] for at least 10 years with restricted access limited to the authors of this study. The data in the DataVault will only be shared in the exceptional case that intended scientific users adhere to the same principles described in our Data Sharing Agreement, Data Management Plan, and Data Protection Impact Assessment; have the same intent for the data use, i.e., mapping the evolving diversity of the geodynamics community; and have formal ethical approval.

For transparency, the MATLAB scripts used for the data analysis and calculation of correlations are available in Crameri et al. (2026).

The figures were produced using the MATLAB figure-making routine DiVA (Crameri, 2020) and are openly available in various formats via the online sharing platform for geoscience graphics s-ink.org (Crameri et al., 2022) [final versions of all the figures will be uploaded and shared upon acceptance of the manuscript].

Author contributions. Conceptualization of the study: IvZ

Data Curation: IvZ, ACG



Formal analysis: IvZ, ACG, FC, JD, CT, AEP

Investigation: IvZ, ACG, FC, JD, CT, AEP

605 Methodology: IvZ, ACG, FC, JD, CT, AEP

Project administration: IvZ, ACG

Software: FC, ACG, JD, AEP

Validation: IvZ, ACG, FC, JD, CT, AEP

Visualisation: FC, ACG, AEP

610 Writing – Original Draft: IvZ, ACG, FC, JD, CT, AEP

Writing – Review & Editing: IvZ, ACG, FC, JD, CT, AEP

Competing interests. Co-author JD is a member of the editorial board of the journal Solid Earth.

Disclaimer. We — the authors of this study — are scientists who consider ourselves part of the geodynamics community. As such, it is important to note that the type of social analysis presented in this work is outside of the normal remit of our expertise in solid Earth
615 geophysics. We therefore apologise for any misinterpretation of social data, as this was not intended.

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620 abstract books in this study (see our Ethical Statement). We are grateful to Gregor Golabek for collecting the abstract books of all previous Ada Lovelace Workshops and making them readily available online; this has allowed us to do this study.

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785 Appendix A: Ada Lovelace Workshops through the years

Table A1. Ada Lovelace Workshops from 1987 to 2024.

Year	Workshop name	Host city	Host country	Number of participants	Women participation
1987	Workshop on numerical simulation of mantle convection	Neustadt an der Weinstrasse	Germany	19	10.5%
1989	Second workshop on mantle convection	La Londe-les-Maures	France	33	15.2%
1991	Workshop on numerical modelling of lithospheric and mantle dynamics	Weilburg/Lahn	Germany	66	15.2%
1993	Physical and numerical modelling of mantle convection and lithospheric dynamics second workshop	Oléron	France	63	14.3%
1995	5th Workshop on numerical modelling of mantle convection and lithospheric dynamics	Vlieland	The Netherlands	55	3.6% (incomplete)
1997	6th European workshop on the numerical modelling of mantle convection and lithospheric dynamics	Naurod	Germany	64	10.9%
2001	7th Workshop on numerical modelling of mantle convection and lithospheric processes	Aussois	France	91	24.2%
2003	8th International workshop on numerical modelling of mantle convection and lithospheric dynamics	Hruba Skala	Czech Republic	96	21.1%
2005	9th International workshop on numerical modelling of mantle convection and lithospheric dynamics	Erice	Italy	111	26.1%
2007	10th International workshop on modelling of mantle convection and lithospheric dynamics	Carry-Le-Rouet	France	97	26.0%
2009	11th International workshop on modelling of mantle convection and lithospheric dynamics	Braunwald	Switzerland	129	31.5%
2011	12th International workshop on modelling of mantle convection and lithospheric dynamics	Gross Dölln	Germany	123	24.4%
2013	13th International workshop on modelling of mantle and lithosphere dynamics	Hønefoss	Norway	96	28.1%
2015	14th International workshop on modelling of mantle and lithosphere dynamics	Oléron	France	111	29.7%
2017	15th International workshop on modelling of mantle and lithosphere dynamics	Putten	The Netherlands	127	36.2%
2019	2019 Ada Lovelace workshop on numerical modelling of mantle and lithosphere dynamics	Siena	Italy	113	31.0%
2022	2022 Ada Lovelace workshop on numerical modelling of mantle and lithosphere dynamics	Hévíz	Hungary	139	37.4%
2024	2024 Ada Lovelace workshop on modelling of mantle and lithosphere dynamics	Sète	France	125	34.4%