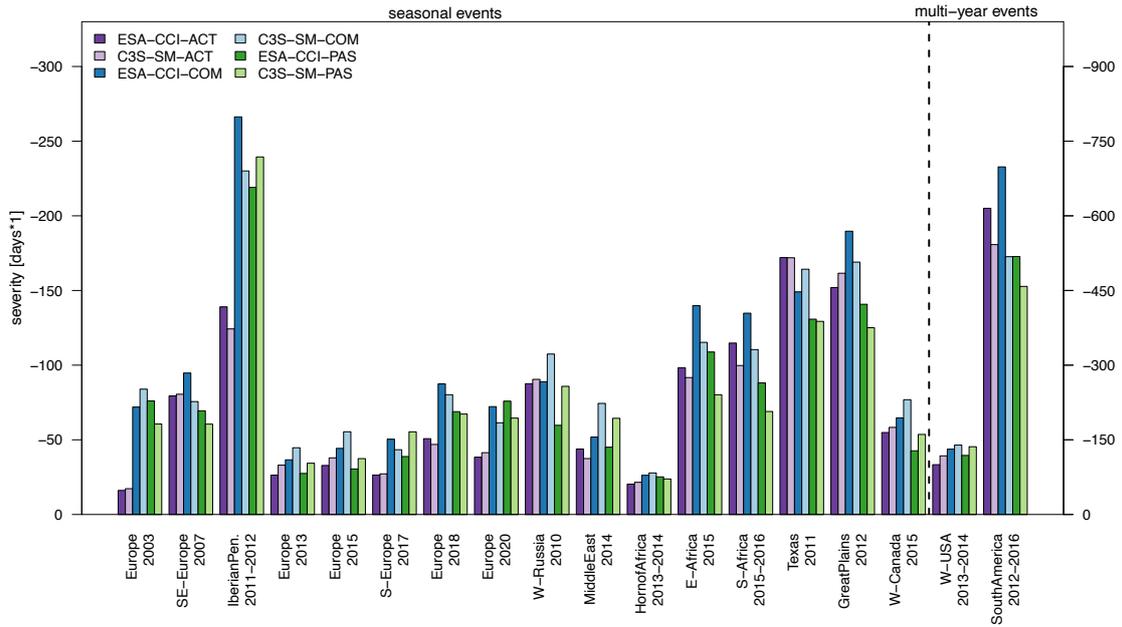
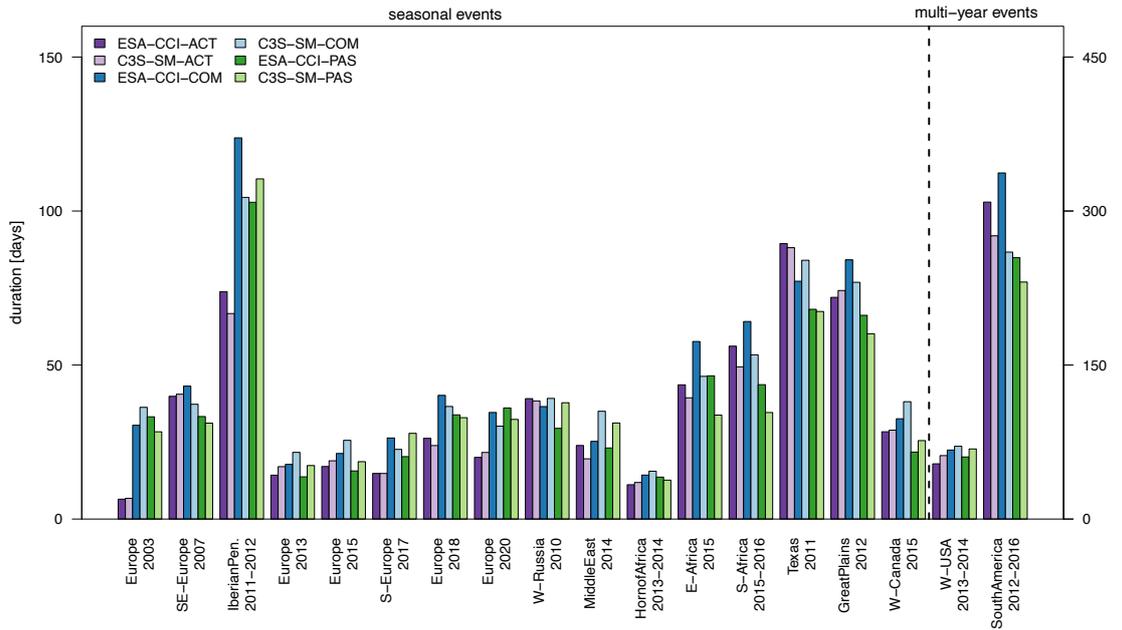
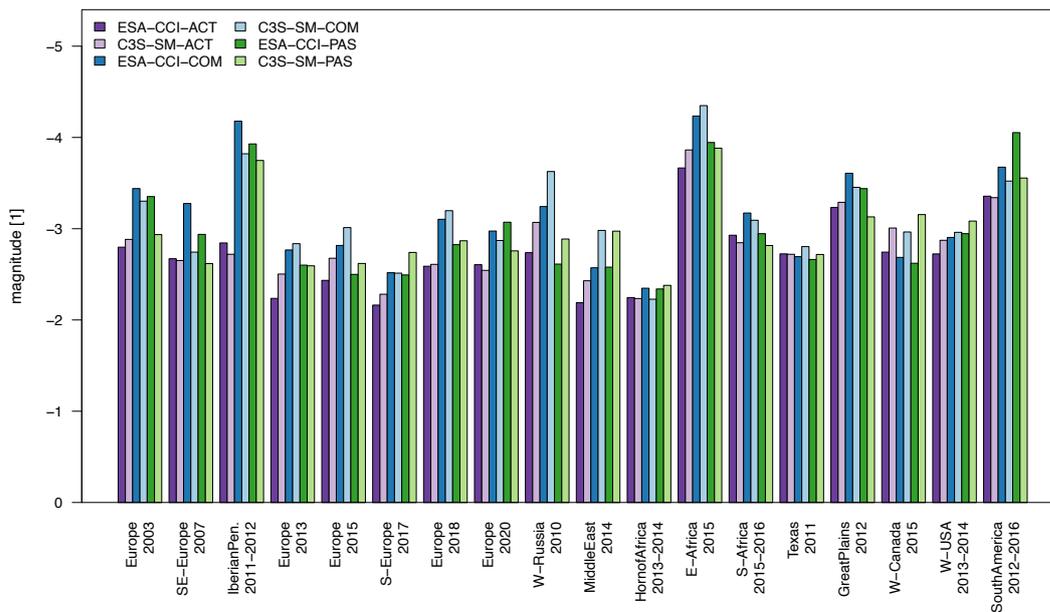
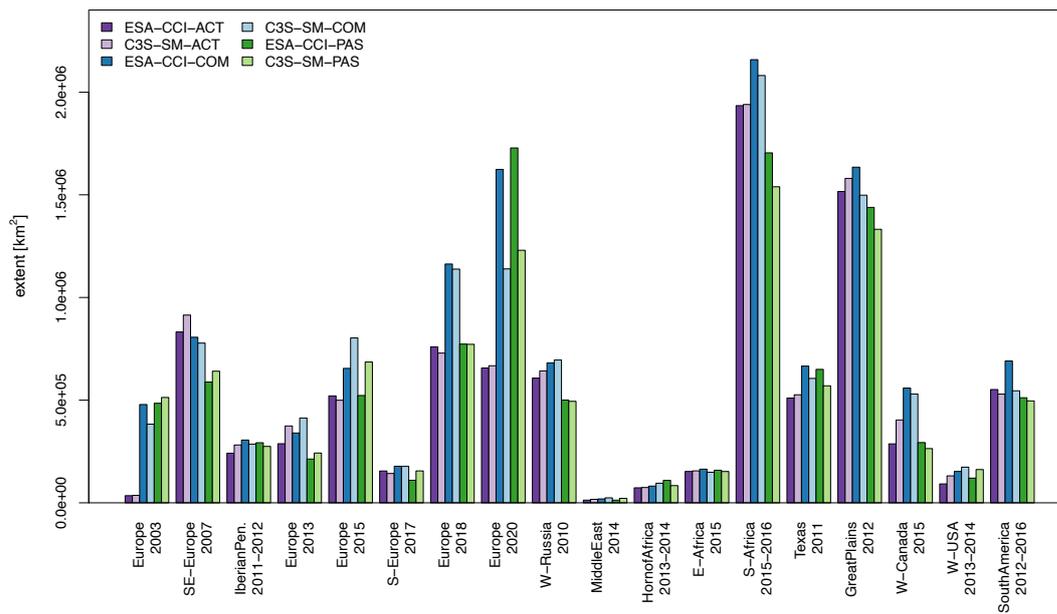
# Supplementary Information

**Supplementary Table 1** Considered major drought events with pre-defined event regions and periods based on the cited references, serving as spatial and temporal bounds for the analysis. Events are ordered chronologically and grouped by seasonal and multi-year events. Note that the Europe 2022 event is only used to introduce the methodology for characterising the drought events, based on the near real-time products only.

| Region | Year | Reference(s) | Start time | End time | Latitude extent | Longitude extent |
|---|---|---|---|---|---|---|
| **Seasonal, sub-annual events** | | | | | | |
| Europe | 2003 | García-Herrera et al. (2010) | 10/06/2003 | 20/08/2003 | 42° N-53° N | 0°-20° E |
| SE-Europe | 2007 | Founda and Giannakopoulos (2009) | 01/05/2007 | 01/08/2007 | 36° N-52° N | 20° E-45° E |
| Western Russia | 2010 | Barriopedro et al. (2011), Hauser et al. (2016) | 10/07/2010 | 20/08/2010 | 50° N-60° N | 35° E-55° E |
| Texas | 2011 | Rupp et al. (2012) | 01/03/2011 | 31/08/2011 | 25° N-37° N | 93° W-107° W |
| Iberian Peninsula | 2011-2012 | Trigo et al. (2013) | 01/09/2011 | 31/08/2012 | 35.9° N-43.9° N | 10° W-3.5° E |
| Great Plains | 2012 | Hoerling et al. (2014) | 01/04/2012 | 30/09/2012 | 31° N-46° N | 82° W-114° W |
| Europe | 2013 | Dong et al. (2014) | 01/06/2013 | 31/08/2013 | 35° N-60° N | 10° W-17° E |
| Horn of Africa | 2013-2014 | Marthews et al. (2015) | 01/10/2013 | 30/06/2014 | 1.75° N-6.5° N | 36° E-42.3° E |
| Middle East | 2014 | Bergaoui et al. (2015) | 01/01/2014 | 28/02/2014 | 30.5° N-33.5° N | 34° E-36.5° E |
| East Africa | 2015 | Funk et al. (2016) | 01/06/2015 | 30/09/2015 | 7° N-14° N | 36.5° E-40.5° E |
| Western Canada | 2015 | Szeto et al. (2016) | 01/03/2015 | 30/09/2015 | 48° N-61° N | 113° W-139° W |
| Europe | 2015 | Dong et al. (2016) | 01/06/2015 | 31/07/2015 | 45° N-55° N | 0°-35° E |
| Southern Africa | 2015-2016 | Yuan et al. (2018) | 01/11/2015 | 30/04/2016 | 10° S-35° S | 10° E-40° E |
| Southern Europe | 2017 | Masante et al. (2018b), Kew et al. (2019) | 01/06/2017 | 30/09/2017 | 36° N-48° N | 8° E-24° E |
| Europe | 2018 | Masante et al. (2018a), Masante and Vogt (2018) | 01/06/2018 | 30/09/2018 | 45° N-68° N | 10° W-35° E |
| Europe | 2020 | Barbosa et al. (2020) | 01/03/2020 | 31/08/2020 | 40° N-68°N | 10° W-35° E |
| Europe | 2022 | Schumacher et al. (2022); Schumacher et al. (2023) | 01/06/2022 | 30/09/2022 | 36° N-58° N | 10° W-30° E |
| **Multi-year events** | | | | | | |
| South America | 2012-2016 | Martins et al. (2018) | 01/01/2012 | 31/12/2016 | 7° S-21° S | 36° W-47° W |
| Western USA | 2013-2014 | Swain et al. (2014), Wang and Schubert (2014) | 01/01/2013 | 31/03/2014 | 32.3° N-42.9° N | 124.6° W-116° W |

**Supplementary Figure 1 As Fig. 6, but for the different remote sensing products only, including ACTIVE and PASSIVE products. Note that for the Europe 2003 event, both ESA-CCI-ACT and C3S-SM-ACT have reduced spatial and temporal coverage due to a sensor failure.**

**Supplementary Figure 2 As Fig. 7 but for the different remote sensing products only, including ACTIVE and PASSIVE products.**

**Supplementary Figure 3 As Fig. 8 but for the different remote sensing products only, including ACTIVE and PASSIVE products.**

**Supplementary Figure 4 As Fig. 9 but for the different remote sensing products only, including ACTIVE and PASSIVE products.**

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