Supplementary material for: A bottom-up emission estimate for the 2022 Nord Stream gas leak: derivation, simulations and evaluation

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1 Simulation setup

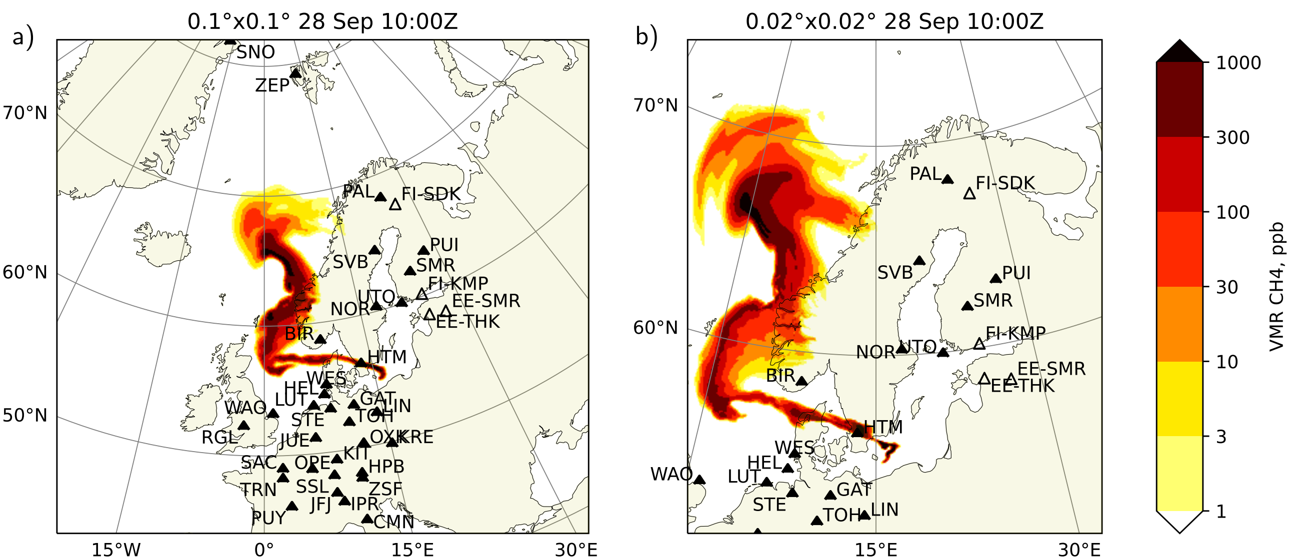

Figure S1. Simulation domains used for the study, and locations of the observation stations. ICOS stations shown with filled symbols.

The simulations were performed with Silam model on two domains shown in Fig. S1. The larger domain was simulated at 0.1-deg and 0.4-deg resolution (Fig. S1a) driven with the same set of operational ECMWF forecasts, The smaller domain was simulated at 0.02-deg resolution (Fig. S1b), with MEPS unperturbed-member forecasts with 2.5-km resolution.

2 Timeseries for Stations

This section shows simulated and observed timeseries for the stations that did not fit to the main paper.

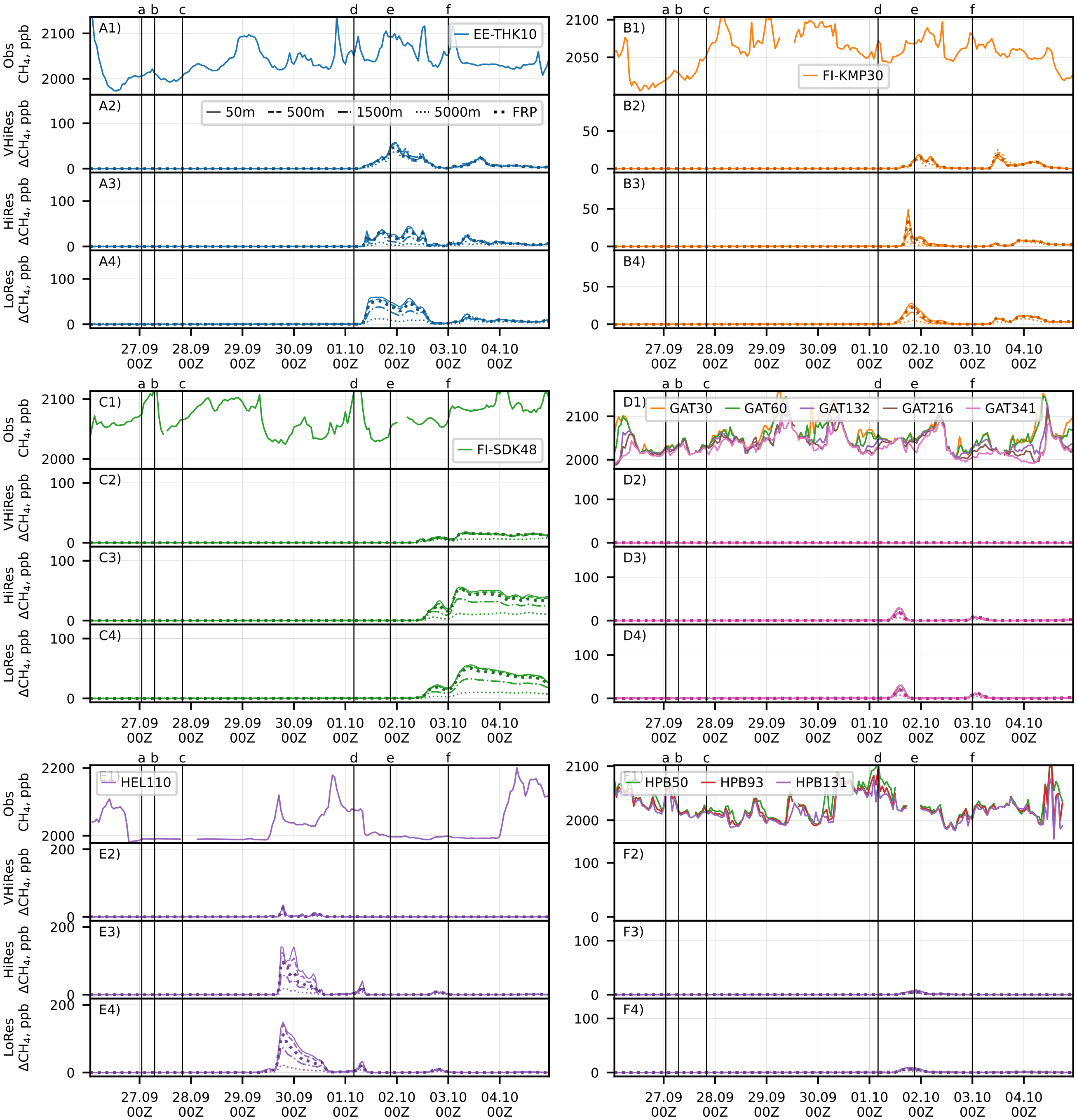

Figure S2. Timeseries of methane mixing ratio observed at EE-THK, FI-KMP, FI-SDK, GAT, HEL and HPB stations after the pipeline rupture, and corresponding timeseries simulated with three different resolutions for several vertical profiles of the release. Each group of panels corresponds to a station. The panels in each group are (top down) for observations, and model with 0.02-deg, 0.1-deg, 0.4-deg resolution. Measurement heights are coded with colors, and emission heights with line styles. Vertical lines mark the moments shown in maps of the main paper

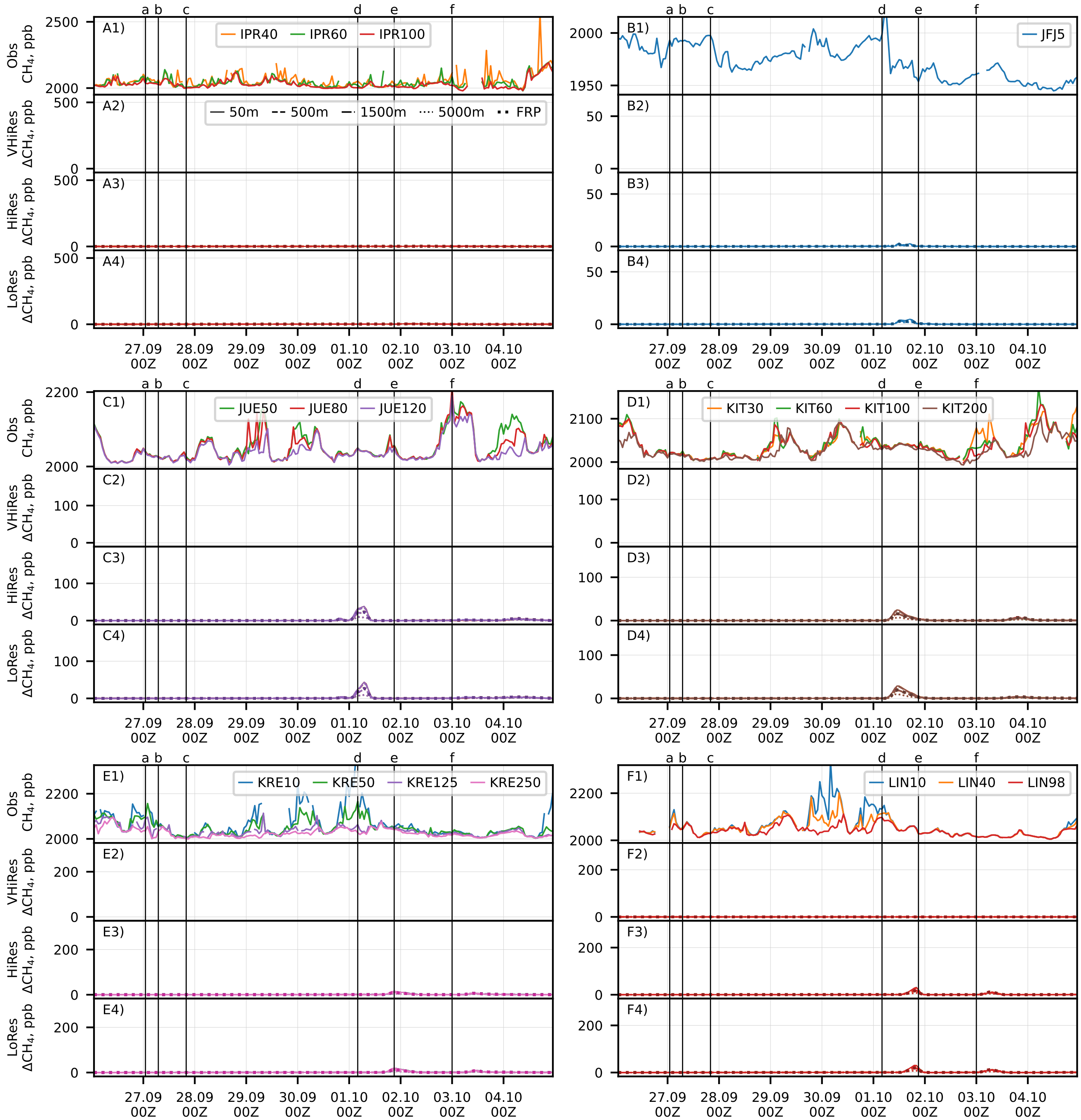

Figure S3. Timeseries of methane mixing ratio observed at IPR, JFJ, JUE, KIT, KRE, and LIN stations after the pipeline rupture, and corresponding timeseries simulated with three different resolutions for several vertical profiles of the release. Each group of panels corresponds to a station. The panels in each group are (top down) for observations, and model with 0.02-deg, 0.1-deg, 0.4-deg resolution. Measurement heights are coded with colors, and emission heights with line styles. Vertical lines mark the moments shown in maps of the main paper

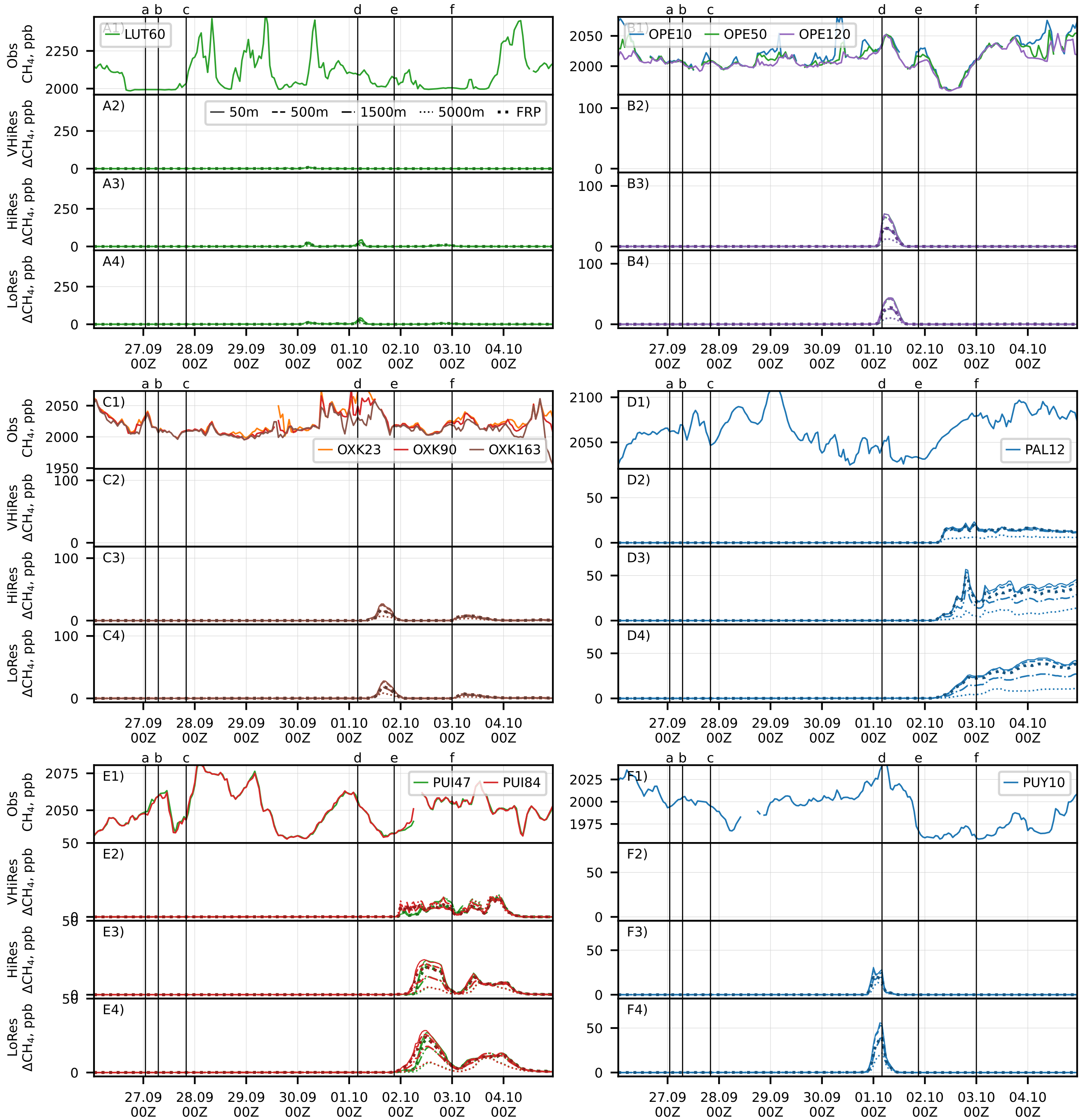

Figure S4. Timeseries of methane mixing ratio observed at LUT, OPE, OXK, PAL, PUI, and PUY stations after the pipeline rupture, and corresponding timeseries simulated with three different resolutions for several vertical profiles of the release. Each group of panels corresponds to a station. The panels in each group are (top down) for observations, and model with 0.02-deg, 0.1-deg, 0.4-deg resolution. Measurement heights are coded with colors, and emission heights with line styles. Vertical lines mark the moments shown in maps of the main paper

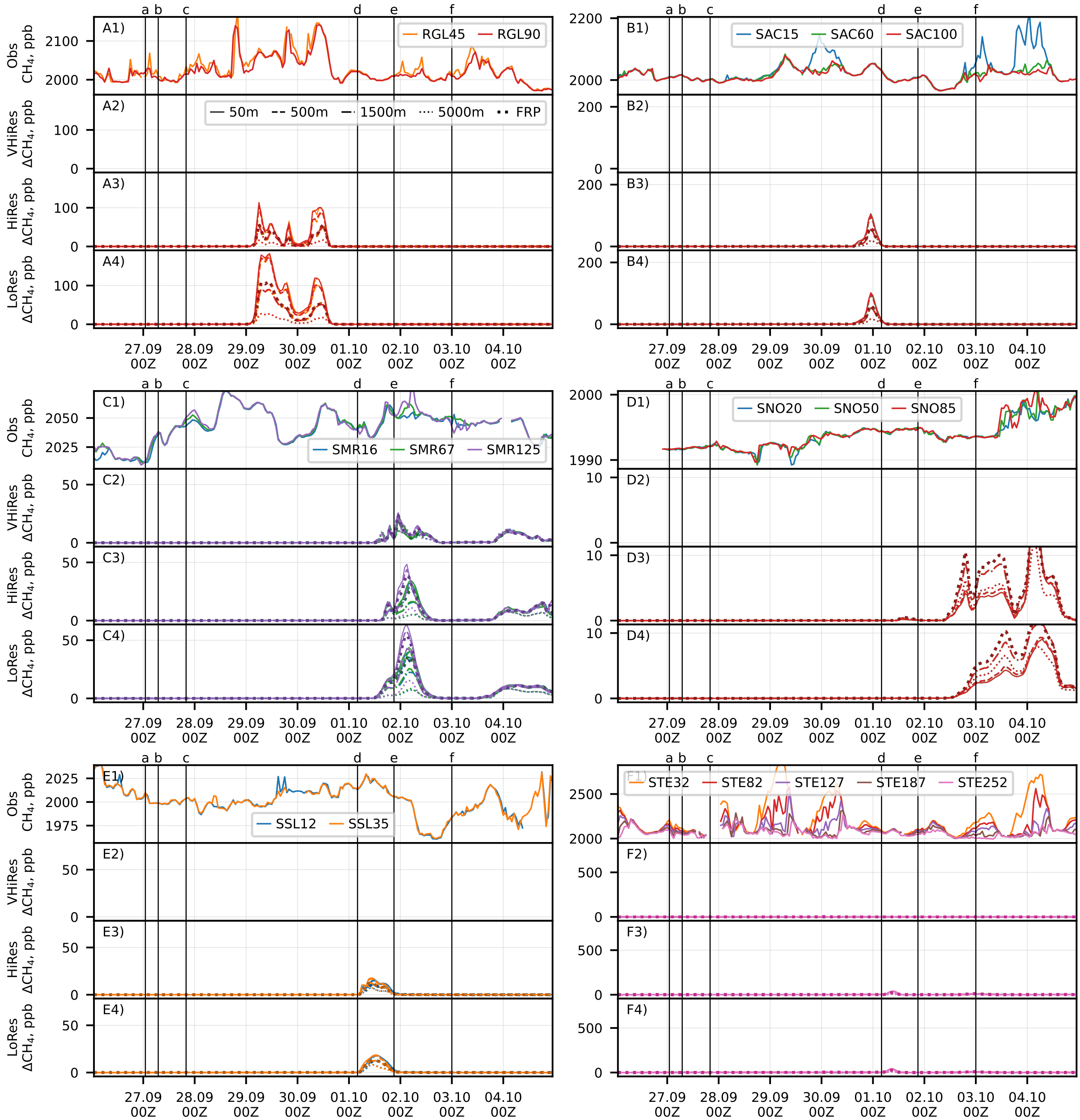

Figure S5. Timeseries of methane mixing ratio observed at RGL, SAC, SMR, SNO, SSL, and STE stations after the pipeline rupture, and corresponding timeseries simulated with three different resolutions for several vertical profiles of the release. Each group of panels corresponds to a station. The panels in each group are (top down) for observations, and model with 0.02-deg, 0.1-deg, 0.4-deg resolution. Measurement heights are coded with colors, and emission heights with line styles. Vertical lines mark the moments shown in maps of the main paper

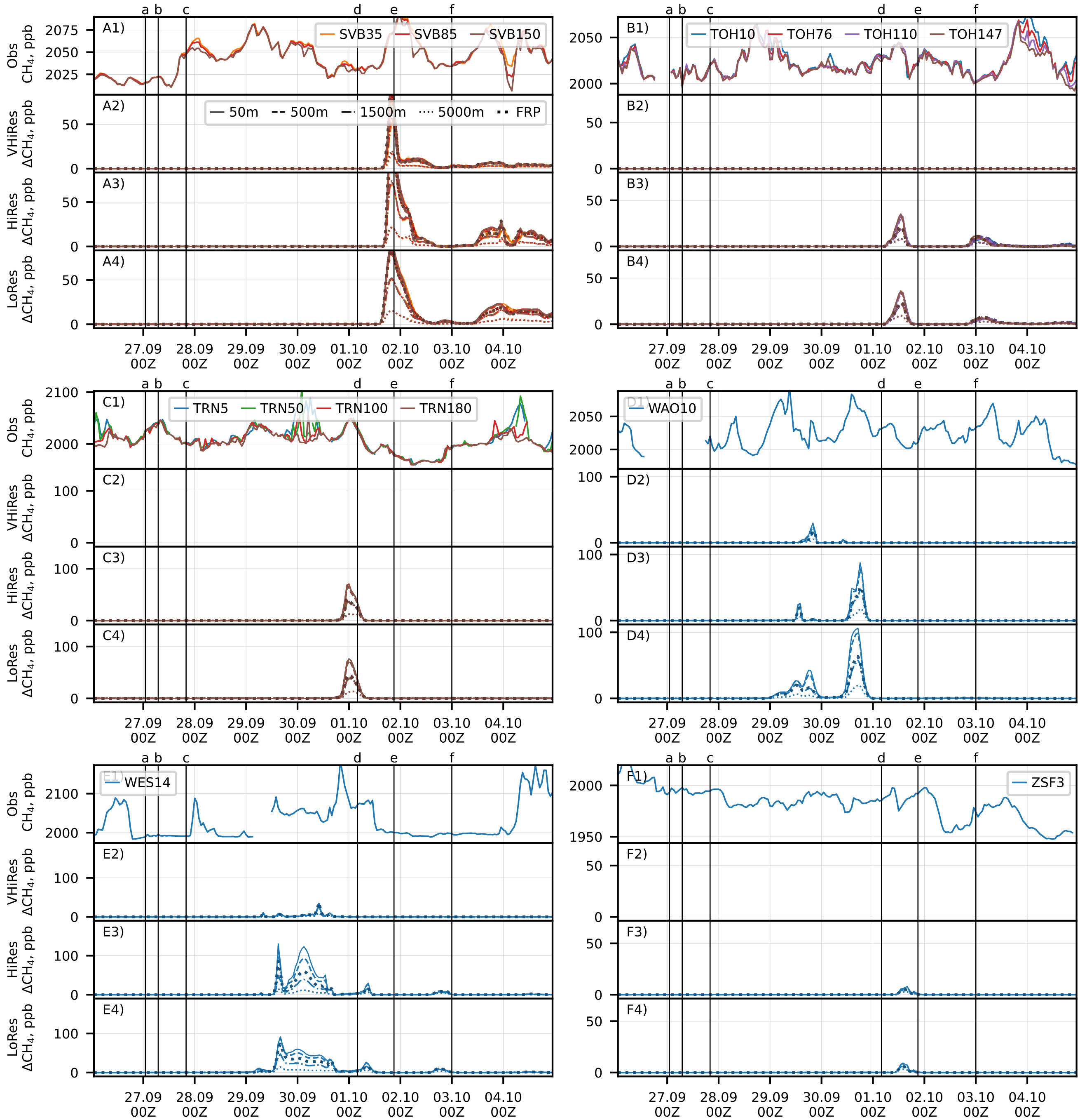

Figure S6. Timeseries of methane mixing ratio observed at SVB, TOH, TRN, WAO, WES, and ZSF stations after the pipeline rupture, and corresponding timeseries simulated with three different resolutions for several vertical profiles of the release. Each group of panels corresponds to a station. The panels in each group are (top down) for observations, and model with 0.02-deg, 0.1-deg, 0.4-deg resolution. Measurement heights are coded with colors, and emission heights with line styles. Vertical lines mark the moments shown in maps of the main paper

3 LES sensitivity simulations

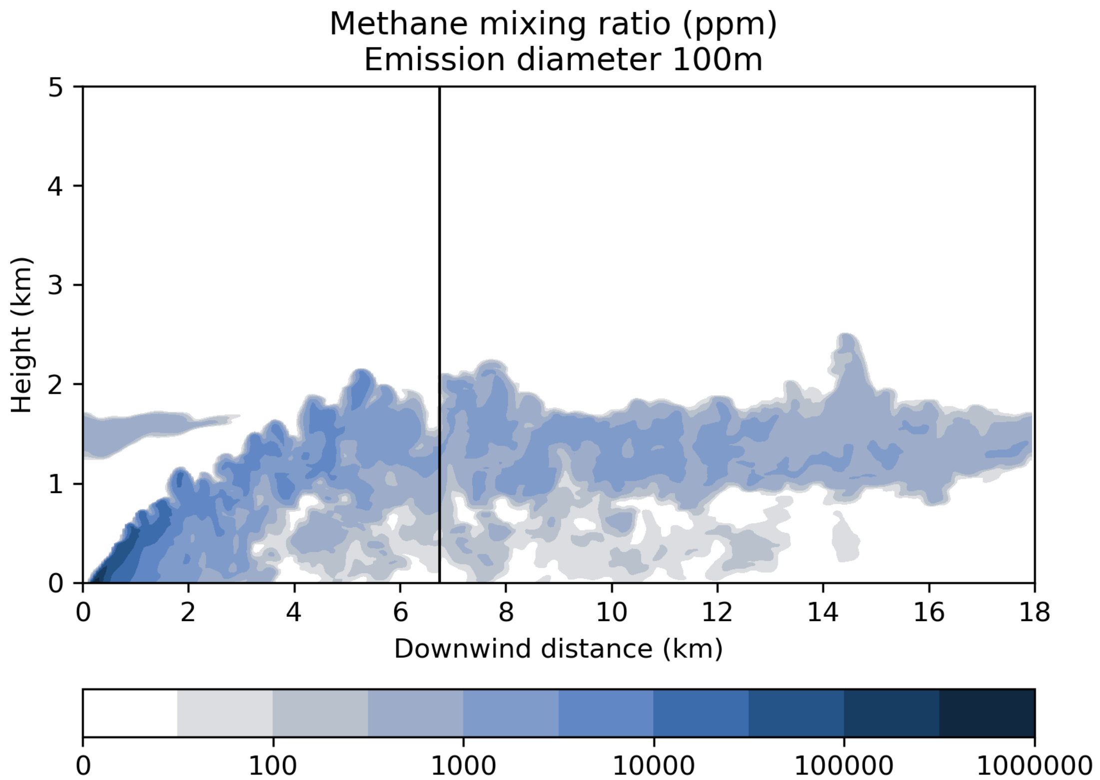

Figure S7. Methane mixing ratio in the central line of the LES simulated plume for the maximum methane release from a circle with 100 m diameter. The vertical line indicates the point where the plume rise has finished.

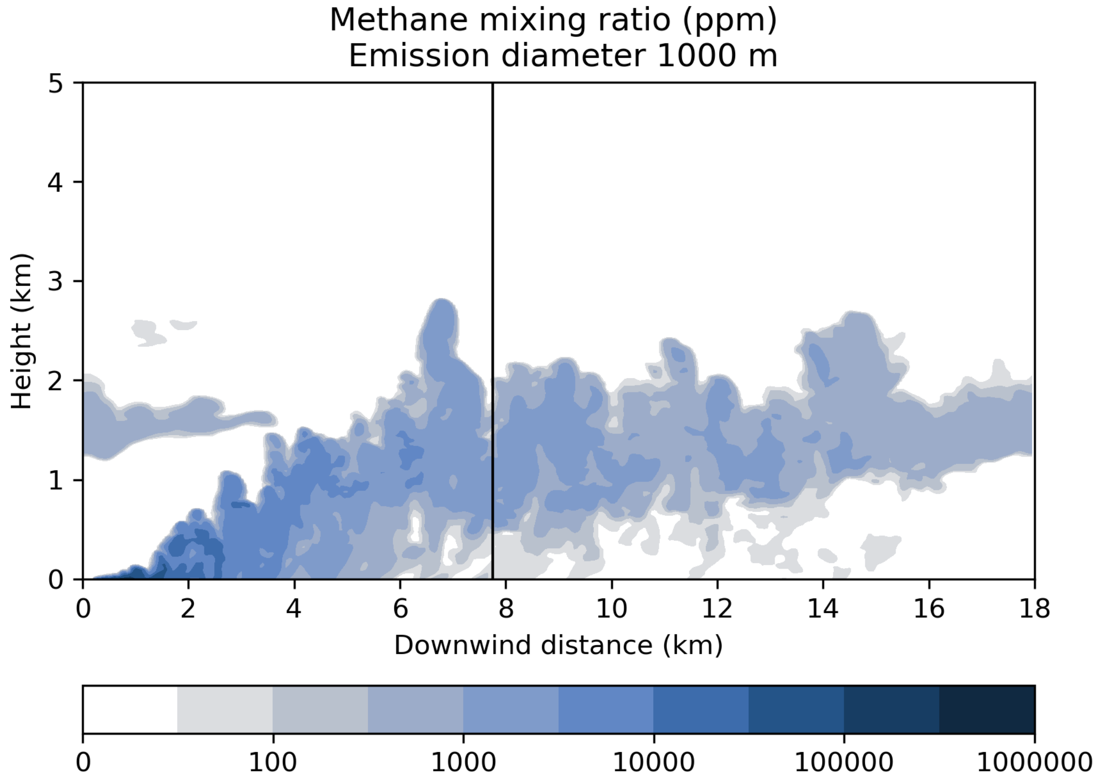

Figure S8. LES simulated plume for the maximum methane release from a circle with 1000 m diameter.

4 Acknowledgments for ICOS data

The ICOS data usage policy (https://www.icos-cp.eu/data-services/about-data-portal/data-license, accessed 30.11.2022) requires each publication to have a reference for each of the time series used for a study, and the references are different for each measurement height at each station. The table below is intended to fulfill this requirement:

Code	References
BIR	Lund Myhre, C., Platt, S. M., Lunder, C., and Hermansen, O.: ICOS ATC NRT CH4 growing time series, Birkenes (10.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/a-OqGFe7Aga6-k7CHen39EyQ, 2022
	Lund Myhre, C., Platt, S. M., Lunder, C., and Hermansen, O.: ICOS ATC NRT CH4 growing time series, Birkenes (50.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/QhtU7Bpi3hW63r_P_YRETTsU, 2022
	Lund Myhre, C., Platt, S. M., Lunder, C., and Hermansen, O.: ICOS ATC NRT CH4 growing time series, Birkenes (75.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/M1WVYeDMy6UtPnSvF6KKmq_L, 2022
GAT	Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Gartow (30.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/V9y--C-FvYXiZfojwVq3bw42, 2022
	Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Gartow (60.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/Yk1xCKJYJSz_GWeATpDA3Rjt, 2022
	Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Gartow (132.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/Rt04d54lFTra9RYcYIGPQN5H, 2022
	Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Gartow (216.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/_qPTkWsLArD9RYD1s8gorAM0, 2022
	Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Gartow (341.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/K5H4gA-BlsJEyT2g8NsCnW9x, 2022
HEL	Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Helgoland (110.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/_NblFnzvy2GGTPpdD0_SpKn-, 2022

HPB Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Hohenpeissenberg (50.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/tpDePhqI3v9_aql5xksIrf8S, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Hohenpeissenberg (93.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/nXNqErmYi8m2wemDaJz_Z9Dr, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Hohenpeissenberg (131.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/GabqfaCOTkNLQnnjz_lMn_6l, 2022

HTM Heliasz, M. and Biermann, T.: ICOS ATC NRT CH4 growing time series, Hyltemossa (30.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/l9QSNSWCe3fqCzL0iTwLU8la, 2022

Heliasz, M. and Biermann, T.: ICOS ATC NRT CH4 growing time series, Hyltemossa (70.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/lV2WF-vf84LsT73z6kWFJgV4, 2022

Heliasz, M. and Biermann, T.: ICOS ATC NRT CH4 growing time series, Hyltemossa (150.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/-uYDRenkp8mfYPJLhekmx9Ko, 2022

IPR Manca, G.: ICOS ATC NRT CH4 growing time series, Ispra (40.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/goYrYu_b3TRzccaCrnviIdJr, 2022

Manca, G.: ICOS ATC NRT CH4 growing time series, Ispra (60.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/6SNNjlS9H053sR6JuOThvobb, 2022

Manca, G.: ICOS ATC NRT CH4 growing time series, Ispra (100.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/XaKdSOVJNeCxDzOMPzmUTSck, 2022

JFJ Emmenegger, L., Leuenberger, M., and Steinbacher, M.: ICOS ATC NRT CH4 growing time series, Jungfraujoch (5.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/k6LNPak_XM3nq3cu_u7wqTo5, 2022

JUE Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Jülich (50.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/UkCEbA_UEl0SfhnwnslYcsPw, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Jülich (80.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/7bmZAct3TdgB6jcyDMu6PDtp, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Jülich (120.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/LjLTsMHdFxBEBOMm_3VfVo8l, 2022

KIT Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Karlsruhe (30.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/-LsGIybsjKN9foX5aNZjBgDD, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Karlsruhe (60.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/KdtRlMM7cTWMgiY4gUFdj_xT, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Karlsruhe (100.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/Ptxukrr5xLtFUId8G0HtsIU-, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Karlsruhe (200.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/b9ItM9jOFqwmxoenJdP8qJfE, 2022

KRE Marek, M., Vítková, G., and Komínková, K.: ICOS ATC NRT CH4 growing time series, Křešín u Pacova (10.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/S9IKaCm185wQ-NnhcVfNr_FV, 2022

Marek, M., Vítková, G., and Komínková, K.: ICOS ATC NRT CH4 growing time series, Křešín u Pacova (50.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/RH17_H2biGCsAT8YmFLMP_po, 2022

Marek, M., Vítková, G., and Komínková, K.: ICOS ATC NRT CH4 growing time series, Křešín u Pacova (125.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/03tUv86UaHEN3HfcnMAdRfiC, 2022

Marek, M., Vítková, G., and Komínková, K.: ICOS ATC NRT CH4 growing time series, Křešín u Pacova (250.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/PCHil9Cvetf_U1WFBOTweAMr, 2022

LIN Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Lindenberg (10.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/E_1Wtk5M0nPoWUNn2C70x4bA, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Lindenberg (40.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/c-IgTGo-sGfd5M1WkwWszTeO, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Lindenberg (98.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/exzokQZTG4d7l_uifabPbE2k, 2022

NOR Lehner, I. and Mölder, M.: ICOS ATC NRT CH4 growing time series, Norunda (32.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/1hIMjlfGI_pDmu8CLT2DNB4R, 2022

Lehner, I. and Mölder, M.: ICOS ATC NRT CH4 growing time series, Norunda (58.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/vZQwyfmtyDbICceVXxEefe7h, 2022

Lehner, I. and Mölder, M.: ICOS ATC NRT CH4 growing time series, Norunda (100.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/DHD1wLPlqqb2Fo-NlWVBHed5, 2022

OPE Ramonet, M., Conil, S., Delmotte, M., Laurent, O., and Lopez, M.: ICOS ATC NRT CH4 growing time series, Observatoire pérenne de l'environnement (10.0m), 2022-03-01–2022-10-13, https://hdl.handle.net/11676/IOygtpKfddma_W3oiuAT1ZwH, 2022

Ramonet, M., Conil, S., Delmotte, M., Laurent, O., and Lopez, M.: ICOS ATC NRT CH4 growing time series, Observatoire pérenne de l'environnement (50.0m), 2022-03-01–2022-10-13, https://hdl.handle.net/11676/z4xqu1w9Z8rnIR0lb4vGHvWF, 2022

Ramonet, M., Conil, S., Delmotte, M., Laurent, O., and Lopez, M.: ICOS ATC NRT CH4 growing time series, Observatoire pérenne de l'environnement (120.0m), 2022-03-01–2022-10-13, https://hdl.handle.net/11676/bZRhd65ajH8SUtOaeQY3Zq8s, 2022

OXK Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Ochsenkopf (23.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/VGRVLKskMd3dXbp_StcMSV1p, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Ochsenkopf (90.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/Z8yAT3JQSwGF1zkhywmq1MG2, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Ochsenkopf (163.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/VGHdiYnPch1Zin7x8VapXcw_, 2022

PAL Hatakka, J.: ICOS ATC NRT CH4 growing time series, Pallas (12.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/rdJeKi7QQOsxwQw3VSeNaj-J, 2022

PUI Lehtinen, K. and Leskinen, A.: ICOS ATC NRT CH4 growing time series, Puijo (47.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/kBDWxEzhukOrauqsMRsEY6EK, 2022

Lehtinen, K. and Leskinen, A.: ICOS ATC NRT CH4 growing time series, Puijo (84.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/DsxourWEp6XbWbHn3NULXXZW, 2022

PUY Colomb, A., Ramonet, M., Yver-Kwok, C., Delmotte, M., Lopez, M., and Pichon, J.-M.: ICOS ATC NRT CH4 growing time series, Puy de Dôme (10.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/zNBneKJ90Iuba1ByX7RFNQsO, 2022

RGL O'Doherty, S., Pitt, J., and Stanley, K.: ICOS ATC NRT CH4 growing time series, Ridge Hill (45.0m), 2022-03-01–2022-10-17, https://hdl.handle.net/11676/sD2PTx5XDbIG6eeL5XsCJYzC, 2022

O'Doherty, S., Pitt, J., and Stanley, K.: ICOS ATC NRT CH4 growing time series, Ridge Hill (90.0m), 2022-03-01–2022-10-17, https://hdl.handle.net/11676/dtiLBJJH-nU7J5lk_eiD7re9, 2022

SAC Ramonet, M., Delmotte, M., and Lopez, M.: ICOS ATC NRT CH4 growing time series, Saclay (15.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/2OEqomsjwEiAuVuh_pmqXaI6, 2022

Ramonet, M., Delmotte, M., and Lopez, M.: ICOS ATC NRT CH4 growing time series, Saclay (60.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/OFcnDyU5n8teVee7cQE4HQMR, 2022

Ramonet, M., Delmotte, M., and Lopez, M.: ICOS ATC NRT CH4 growing time series, Saclay (100.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/bYoPT0y8E9jQTPz8-3wdKATq, 2022

SMR Mammarella, I.: ICOS ATC NRT CH4 growing time series, Hyytiälä (16.8m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/_VIaDFlasf9eqC00lc0Wt8ld, 2022

Mammarella, I.: ICOS ATC NRT CH4 growing time series, Hyytiälä (67.2m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/OHBTBXX_moBvOamYhLuK91kN, 2022

Mammarella, I.: ICOS ATC NRT CH4 growing time series, Hyytiälä (125.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/8Z0_no6uqvW-Z5-YaxG-p2zu, 2022

SNO Sørensen, L. L.: ICOS ATC NRT CH4 growing time series, Station Nord (20.0m), 2022-03-01–2022-10-15, https://hdl.handle.net/11676/0VId_7TCnbnB0ewwRq3KKDxA, 2022

Sørensen, L. L.: ICOS ATC NRT CH4 growing time series, Station Nord (50.0m), 2022-03-01–2022-10-15, https://hdl.handle.net/11676/om8NsBr5VVrBDXEGK6r3Dqk_, 2022

Sørensen, L. L.: ICOS ATC NRT CH4 growing time series, Station Nord (85.0m), 2022-03-01–2022-10-15, https://hdl.handle.net/11676/rvVRDSVnmZc8OYVqYW5Ud7WA, 2022

SSL Schmidt, M., Hoheisel, A., and Meinhardt, F.: ICOS ATC NRT CH4 growing time series, Schauinsland (12.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/WRq3GAacDZ5efGRvXy5lNLEh, 2022

Schmidt, M., Hoheisel, A., and Meinhardt, F.: ICOS ATC NRT CH4 growing time series, Schauinsland (35.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/T0VPT5fzrNglUJHBid_3-XGr, 2022

STE Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Steinkimmen (32.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/m6ruG6tLLMDKHDxYhBf7fZTC, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Steinkimmen (82.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/FoGwNwIRz6miY_iQAjP2I1i7, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Steinkimmen (127.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/REnpItg_iiGxHJ5xtWnP_8bw, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Steinkimmen (187.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/UpPwac-1xsF8iv5W5HLczqXE, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Steinkimmen (252.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/u8RiEqWrtgCYI2-gz3PPHggC, 2022

SVB Smith, P. and Marklund, P.: ICOS ATC NRT CH4 growing time series, Svartberget (35.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/oMP0-ilovLa_FgN-mn_VE8_a, 2022

Smith, P. and Marklund, P.: ICOS ATC NRT CH4 growing time series, Svartberget (85.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/wDec3ThQnChg1AJn00AoaUeY, 2022

Smith, P. and Marklund, P.: ICOS ATC NRT CH4 growing time series, Svartberget (150.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/2Y3LTpc1OkrZeghUt5EDj6g-, 2022

TOH Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Torfhaus (10.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/CSuR9J0R-G44NUHHOyiSC3bD, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Torfhaus (76.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/ZAQZlwraiwdboq9yq9FgQLUj, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Torfhaus (110.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/p2KhPvHpj7cwkB-MBTTQlIAs, 2022

Kubistin, D., Plaß-Dülmer, C., Kneuer, T., Lindauer, M., and Müller-Williams, J.: ICOS ATC NRT CH4 growing time series, Torfhaus (147.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/G7UZq17cJOv73PD8C1F6pXa5, 2022

TRN Ramonet, M., Lopez, M., and Delmotte, M.: ICOS ATC NRT CH4 growing time series, Trainou (5.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/OibG252tDcaEI2MOD78vbqgF, 2022

Ramonet, M., Lopez, M., and Delmotte, M.: ICOS ATC NRT CH4 growing time series, Trainou (50.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/05LuKIlGSSNQfFa5L0ZgBVLA, 2022

Ramonet, M., Lopez, M., and Delmotte, M.: ICOS ATC NRT CH4 growing time series, Trainou (100.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/7wYtAL9Y38kh3ED0atWrHhiV, 2022

Ramonet, M., Lopez, M., and Delmotte, M.: ICOS ATC NRT CH4 growing time series, Trainou (180.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/f-MK6g3DvGYhi8kS4-UVQ-Dx, 2022

UTO Hatakka, J. and Laurila, T.: ICOS ATC NRT CH4 growing time series, Utö - Baltic sea (57.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/yFO_L2onDwckHg_2194ej4Mx, 2022

WAO Forster, G. and Manning, A.: ICOS ATC NRT CH4 growing time series, Weybourne (10.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/YBfukffFk8tReEQDf5sj5sLM, 2022

WES Couret, C. and Schmidt, M.: ICOS ATC NRT CH4 growing time series, Westerland (14.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/5L0cqOHBSQZUPwtzBf-SNXzs, 2022

ZEP Lund Myhre, C., Platt, S. M., Hermansen, O., and Lunder, C.: ICOS ATC NRT CH4 growing time series, Zeppelin (15.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/jRuxDepDwdYIgT6bnMyS1Kb4, 2022

ZSF Couret, C. and Schmidt, M.: ICOS ATC NRT CH4 growing time series, Zugspitze (3.0m), 2022-03-01–2022-10-16, https://hdl.handle.net/11676/Nt6A1n9YgfvESDwZ2tbTu5hE, 2022