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Motivation

Data management and open research

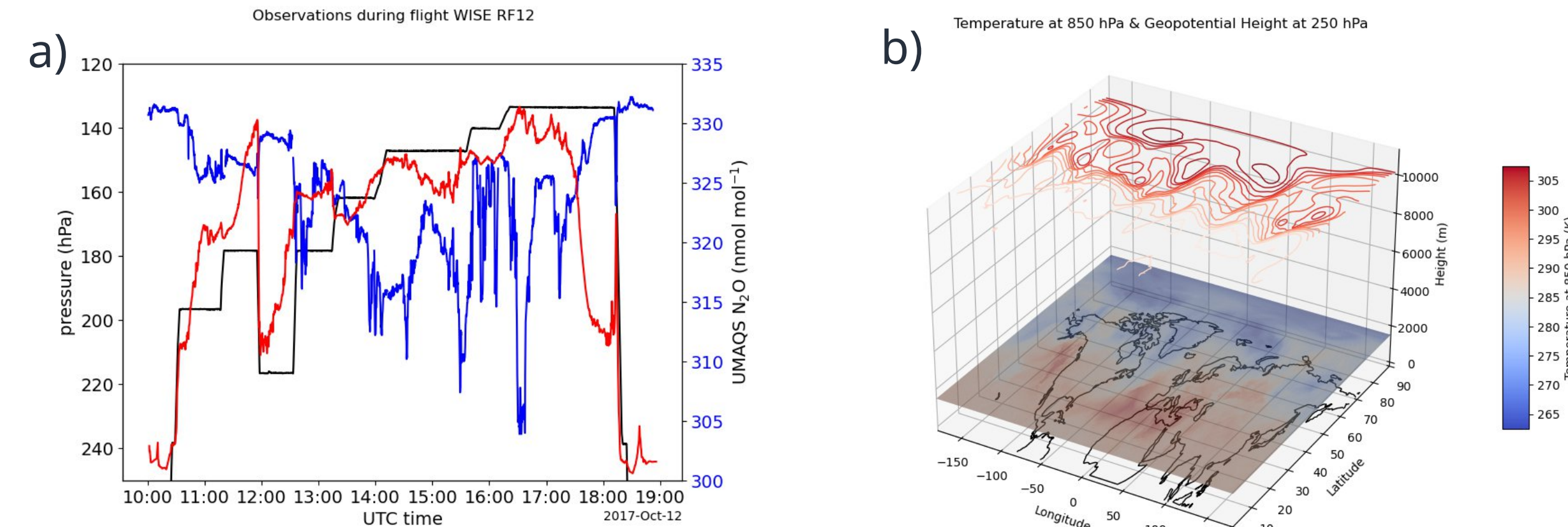


Figure 1: Examples of data products within this CRC. Specifically, (a) shows a time series plot of observational data, here the mixing ratio of nitrous oxide measured during one flight of a research aircraft campaign (in blue) along with auxiliary data from the ERA5 reanalysis, namely potential vorticity (in red). In contrast, (b) shows gridded reanalysis data, here the temperature at 850 hPa (color-coded) and the geopotential height at 250 hPa (red contour lines).

- Within this CRC a variety of observational and model data are created and/or used separately or in combination for data analysis.
- Managing this data properly is crucial for current and future work.

Forecast products

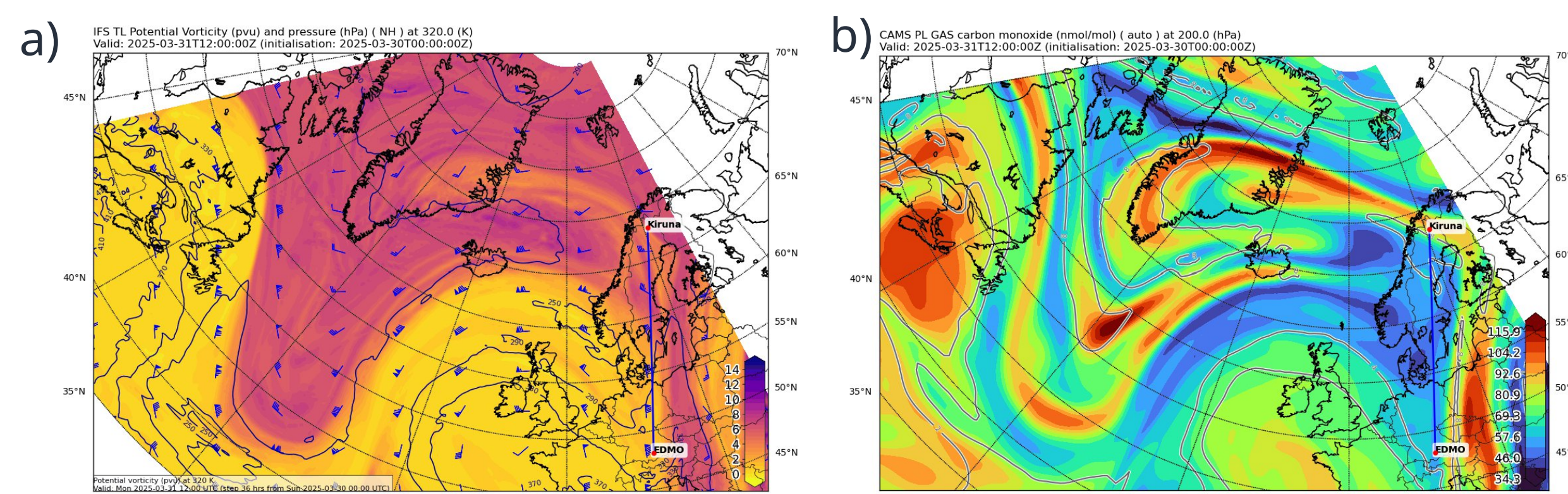


Figure 2: Example top views from a Mission Support System (Bauer et al., 2022) server showing potential vorticity (in pvu) from the ECMWF IFS model in (a) and carbon monoxide (in ppbv) from the ECMWF CAMS model in (b). The blue line shows a hypothetical flight track from Oberpfaffenhofen, Germany to Kiruna, Sweden.

- Within this CRC airborne field campaigns play a crucial role.
- Observation quality of specific processes strongly depend on the availability of accurate and timely forecast products.

Collaborations within TPChange

A01-A07

B01-B09

C01-C09

Z01, Z03

close exchange on data relevant topics with all projects of TPChange

Phase I

Data management: infrastructure and support

- Source code management:
 - Gitlab (internal): <https://gitlab.rlp.net/tpchange>
 - Github (external): <https://github.com/tpchange>
- Data archive: JGU iRODS
- Publishing data: Zenodo community

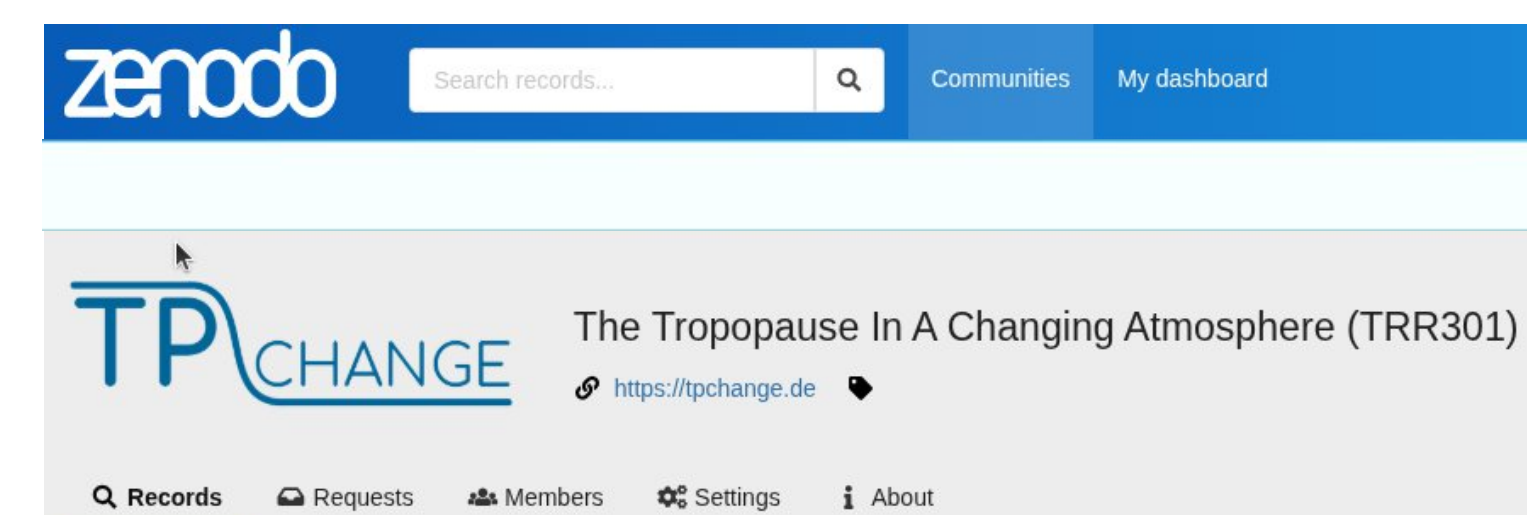


Figure 3: TPChange ZENODO community (<https://zenodo.org/communities/tpchange>)

- Providing and distributing data
 - On site hosting of data sets (e.g., ERA5, IAGOS)
- Training of ECRs
 - Hands-on courses for Git and iRODS
 - Support during data publishing
- Provision of data management plan open accessible: https://github.com/tpchange/tpchange_dmp

Technical infrastructure:

- Linux server for sharing data and collaborative work
- Providing storage dedicated for TPChange

Forecasts for measurement campaigns

- Mission Support System (Bauer et al., 2022)
- Forecast and hindcast support for meteorology (ECMWF IFS data) and chemical composition (ECMWF CAMS data)
- Support during
 - PHILEAS 2023 (Riese et al., 2025)
 - TPEx I 2024 (Bozem et al., 2025)
 - ASCCI 2025
 - NAWDIC dry run 2025

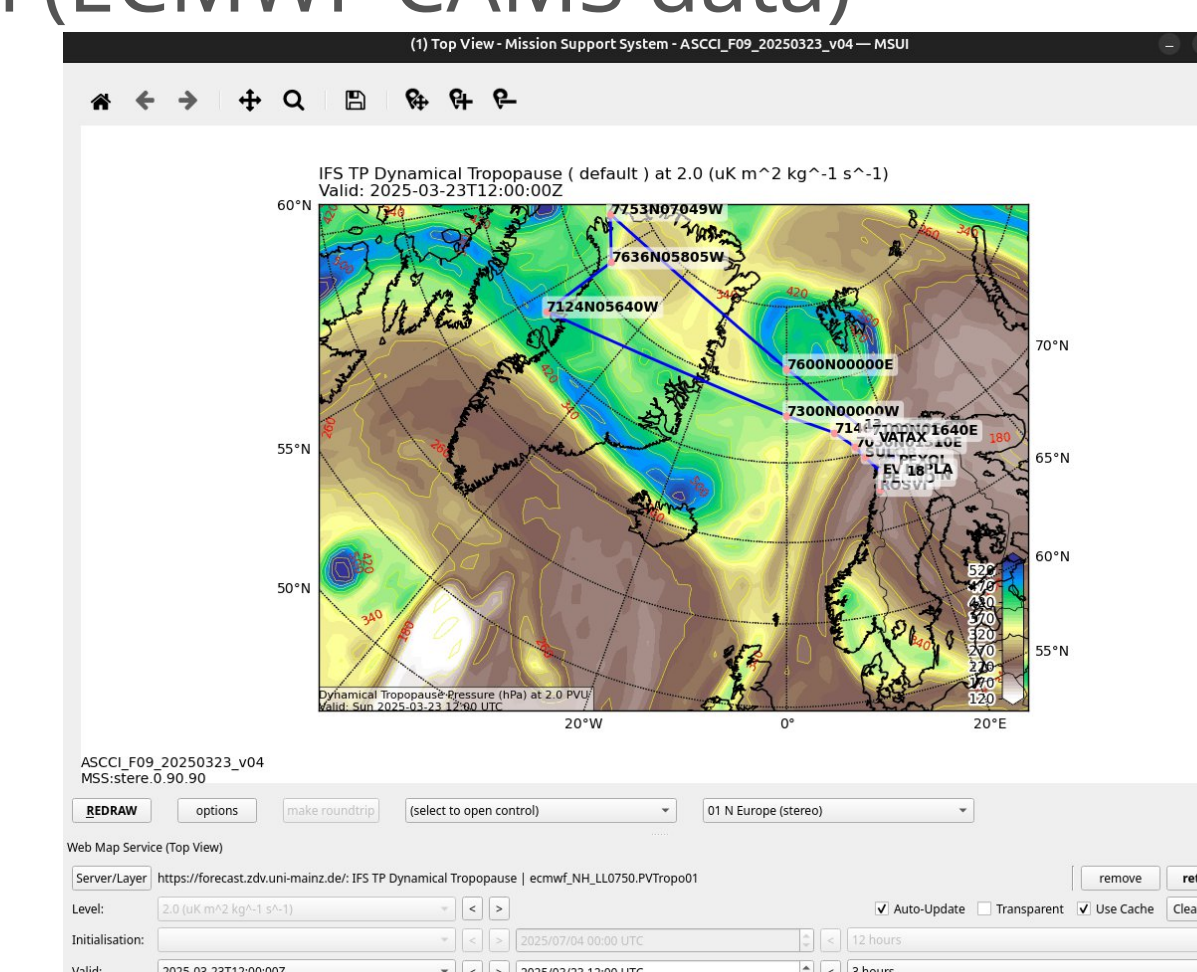


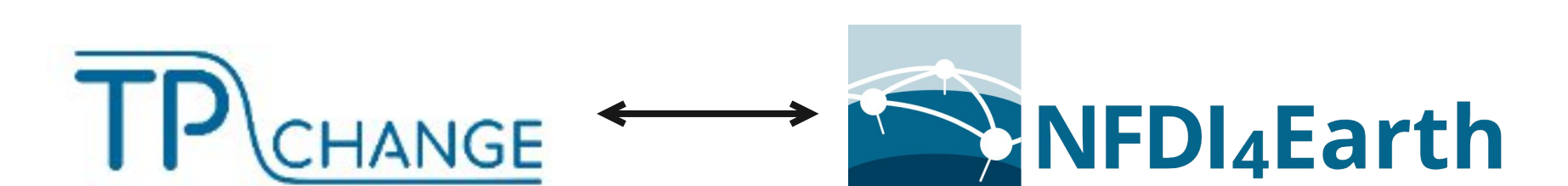
Figure 4: Mission Support System graphical user interface with an example from the ASCCI campaign, showing the pressure of the 2 PVU surface and a flight path.

Phase II

Main goal: Data and campaign support as well as data availability within and outside TPChange

Data management/stewardship

- Continue to provide IT infrastructure
- Improve internal data exchange among TPChange members
- Extend external data availability and access of TPChange data (in collaboration with the national data management infrastructure – NFDI)
- Provide training and support for data management tools (source code management, data archiving, data publication)



Campaign support synthesis data sets (previously in Z01)

- Campaign support data (created and published in project Z01 in Phase I) now hosted in Z02
- Interactive access of this data through a web based interface
- Inclusion of TPChange data in the NFDI4Earth database

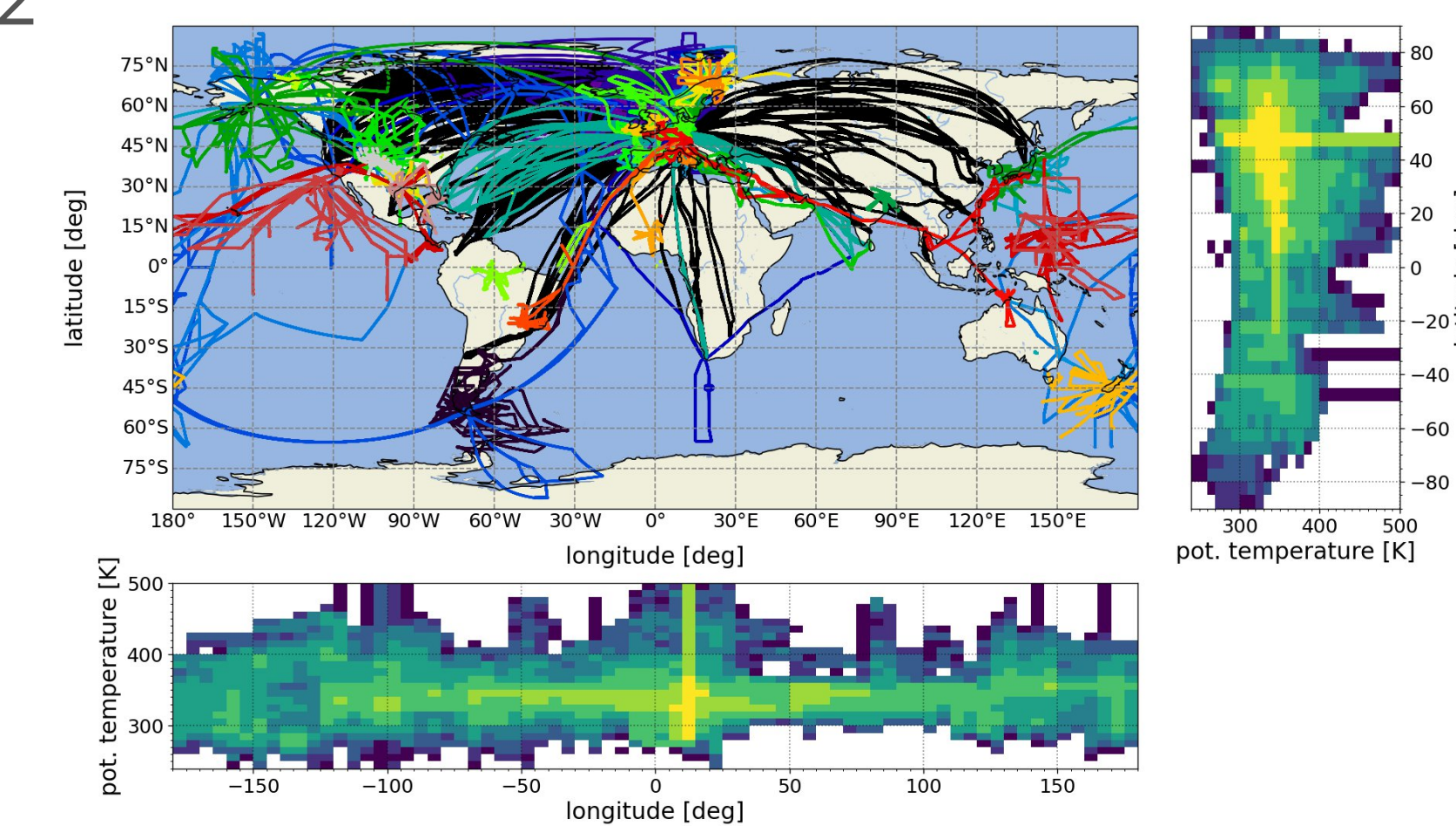


Figure 5: Spatial distribution of the flights. Map: Each campaign in a different color. Profiles: Data density in 5° and 10 K bins.

Campaign support

- TPEx II: Organisation of meetings & Coordination of forecasts
- Extension of data availability in the Mission Support System for future field campaigns to further improve planning of research flights (aircraft, balloons, ...)
- Include other deterministic forecast products (ICON, GFS model forecasts)
- Include ensemble model forecast products
- Include derived diagnostics dedicated for UTLS research, e.g., WCB outflow probabilities