



Bridging History and Climate Science

ClimeApp: Data processing tool for the ModE-RA Global Climate Reanalysis

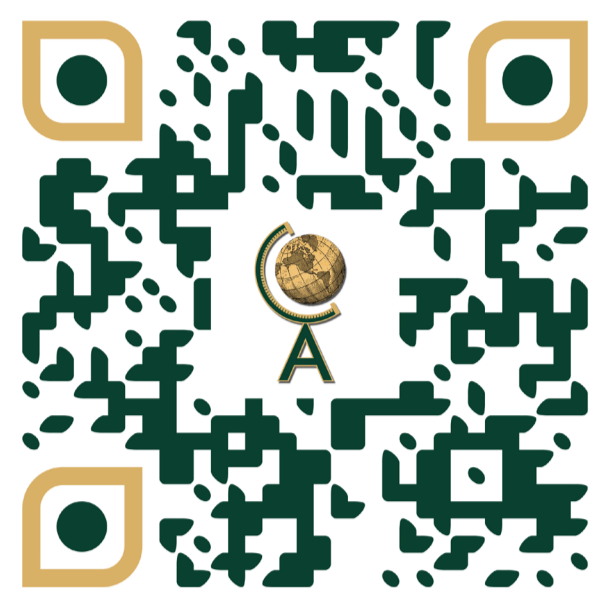
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What is ClimeApp?



ClimeApp is a new web application (see Fig. 2) for accessing the state-of-the-art ModE-RA paleo-climate reanalysis [1]. It can be used to display and analyse temperature, precipitation and pressure reconstructions with global coverage and monthly resolution from 1422 to 2008.

ClimeApp is available at: <https://mode-ra.unibe.ch/climeapp/>

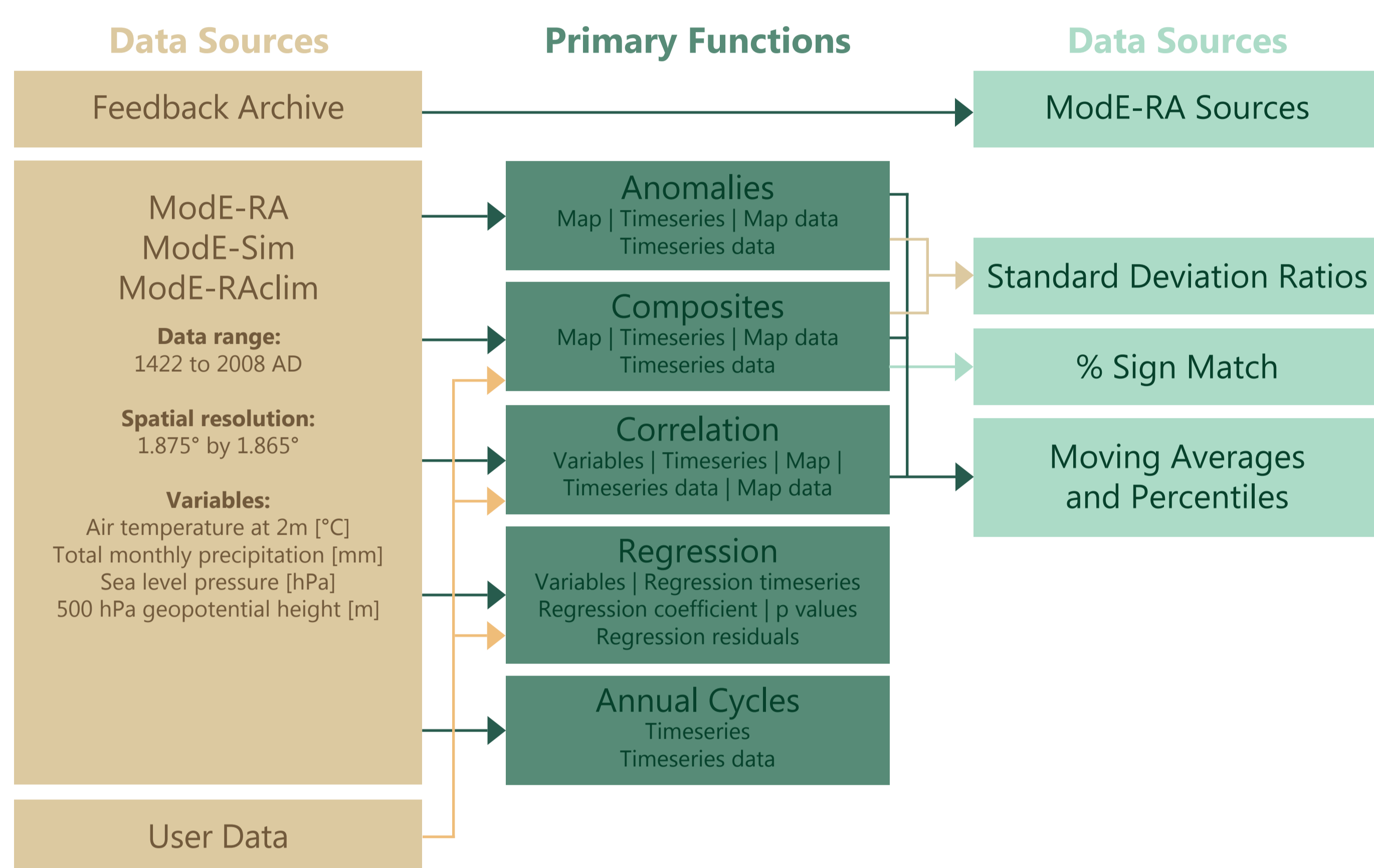


Figure 1: Summary of the data sources used by ClimeApp, along with its five primary functions and current options for further data analysis.

What data does it use?

ClimeApp gives access to three data products:

- The ModE-RA reanalysis – a huge reanalysis of the past global climate, combining the latest climate models with 600 years of paleoclimate observations [1].
- ModE-Sim – an ensemble of bounded climate models; forms the basis of ModE-RA [2].
- ModE-RAclim – an alternative version of ModE-RA, constructed primarily from observations, with limited input from the climate models [1].

Furthermore, users can view the assimilated observations, the so called Feedback Archive (Fig. 1), used to construct ModE-RA (Fig. 2).

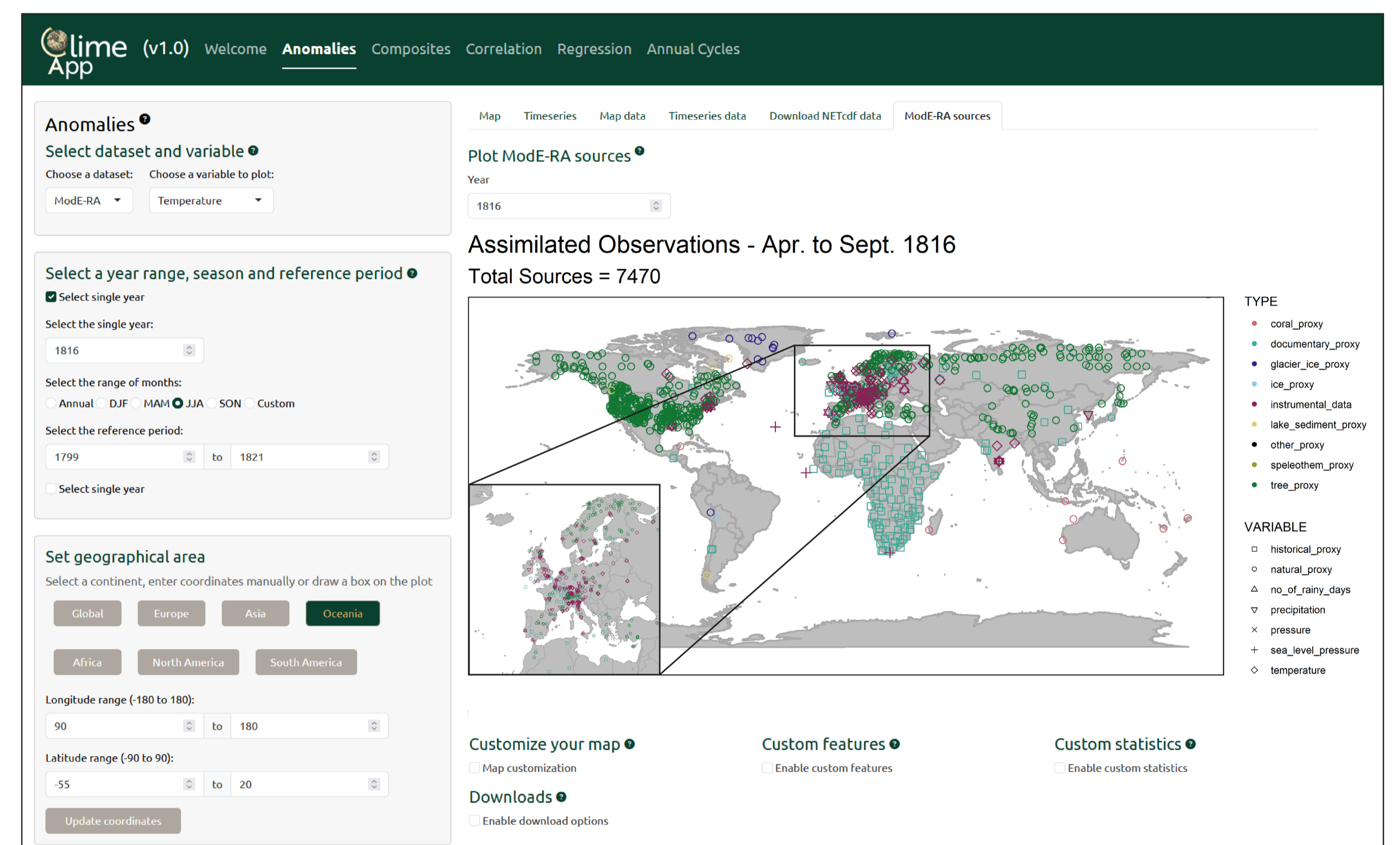


Figure 2: User Interface of ClimeApp.

What can I use ClimeApp for?

- » Accessing palaeo-climate data
- » Uploading your own data sources
- » Correlating climate and historical data
- » Analysing climate variability
- » Integrating climate data into research and teaching
- » Creating and downloading custom maps and plots

Tambora re-analysed

Using ClimeApp and the ModE datasets, we can effortlessly look at extreme events such as volcanic eruptions or heat years. For instance, we can revisit the climate impact of the disastrous 1815 Tambora eruption, and the following “year without a summer” in Europe. (Fig. 3A–D).

Comparing the reanalysis datasets

Comparing the three ModE datasets can yield new insights into both climatology and the reanalysis data. We can see how the ModE-RA anomalies (Fig. 3A+C) are significantly stronger than the climate models ModE-Sim (Fig. 3B), perhaps suggesting a non-volcanic factor behind the “year without a summer” [3].

Using historical data

ClimeApp also allows users to upload their own historical data to be combined with reanalysis data (Fig. 4).

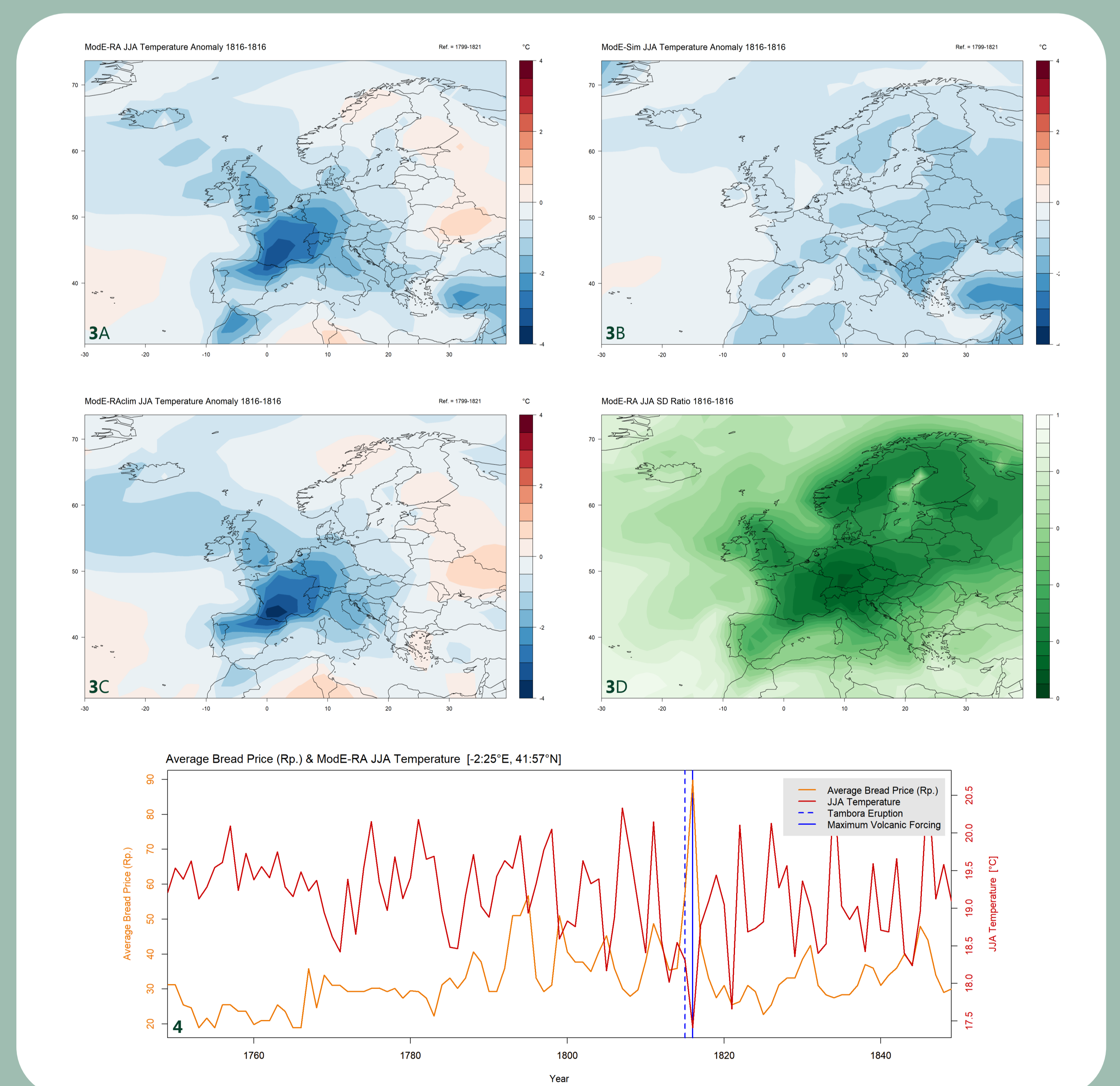


Figure 3: A, B & C) The impact of Tambora can be seen in the significant European summer temperature anomalies of 1816. D) The SD ratio measures model constraint by comparing the difference in spread between the ensembles of ModE-RA and ModE-Sim.

Figure 4: Central European JJA temperatures and (lagged) bread prices in Lucerne, Switzerland, showing a correlation of $r \approx -0.3$.

Contact

For feedback and suggestions on ClimeApp: climeapp.hist@unibe.ch

For queries relating to the ModE-RA data: Jörg Franke: franke@giub.unibe.ch

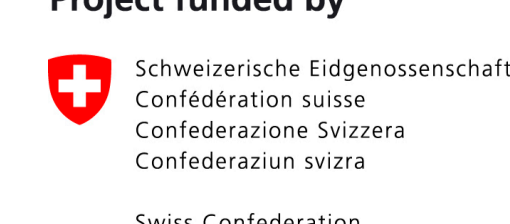
References

- [1] Valler, V., et al. : ModE-RA: a global monthly paleo-reanalysis of the modern era 1421 to 2008, *Sci. Data*, 11, 1–19, 2024.
- [2] Hand, R., et al. : ModE-Sim – a medium-sized atmospheric general circulation model (AGCM) ensemble to study climate variability during the modern era (1420 to 2009), *Geosci. Model Dev.*, 16, 4853–4866, 2023.
- [3] Brönnimann, S. and Krämer, D.: Tambora and the “Year Without a Summer” of 1816. A perspective on earth and human systems science, *Geographica Bernensia*, 90, Geographica Bernensia, 2016.

Acknowledgements

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