

ESMValTool

A community diagnostic and performance metrics tool for evaluation and analysis of Earth system models

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ESMValTool

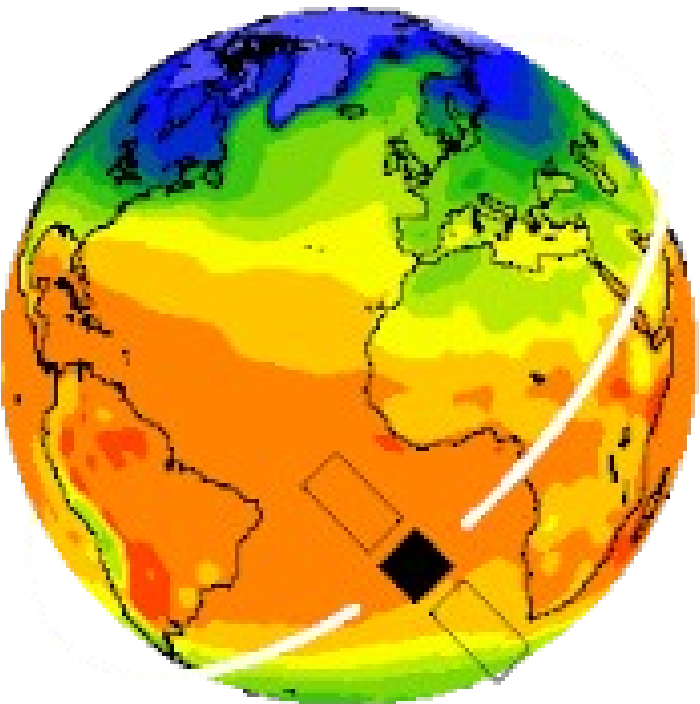
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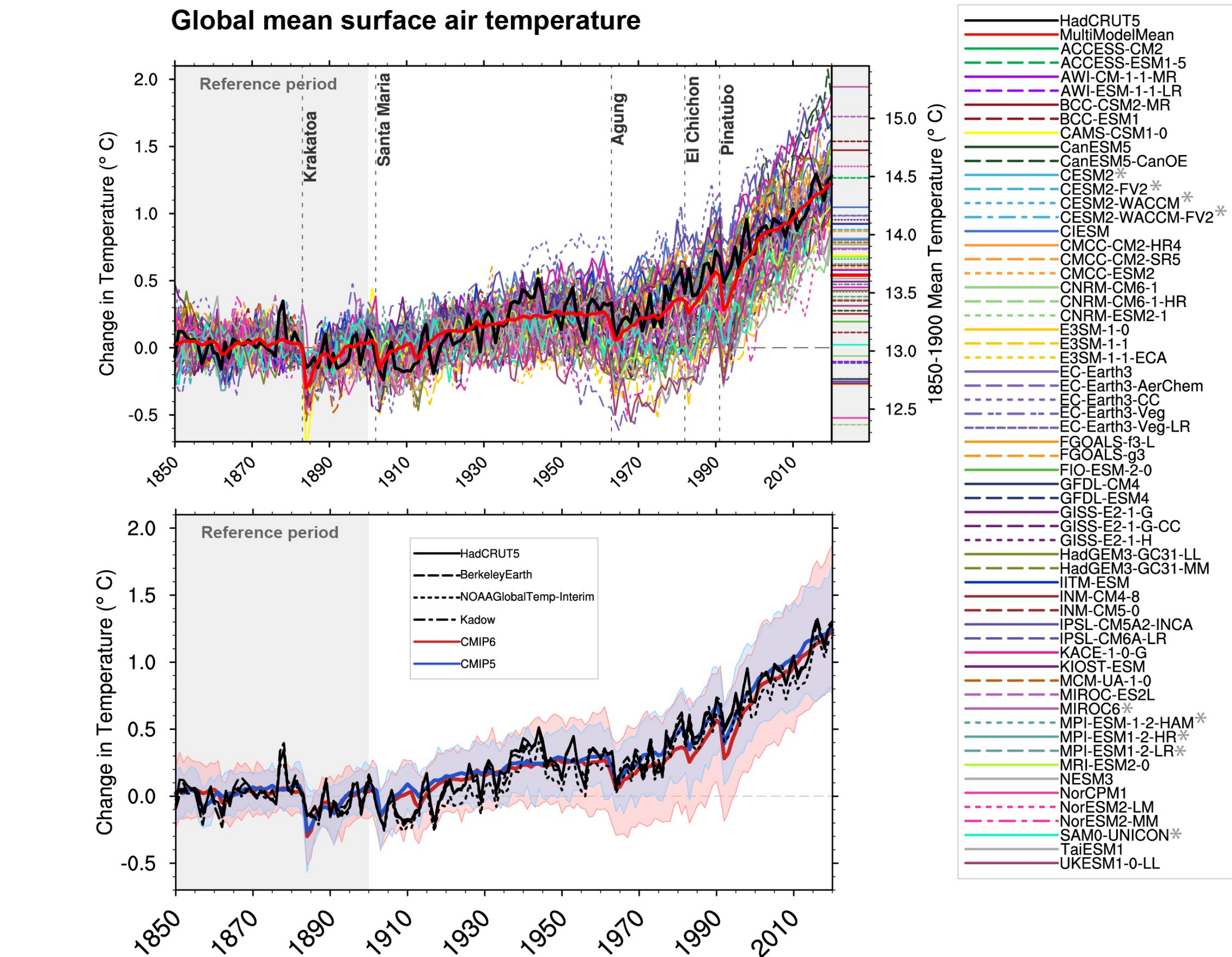
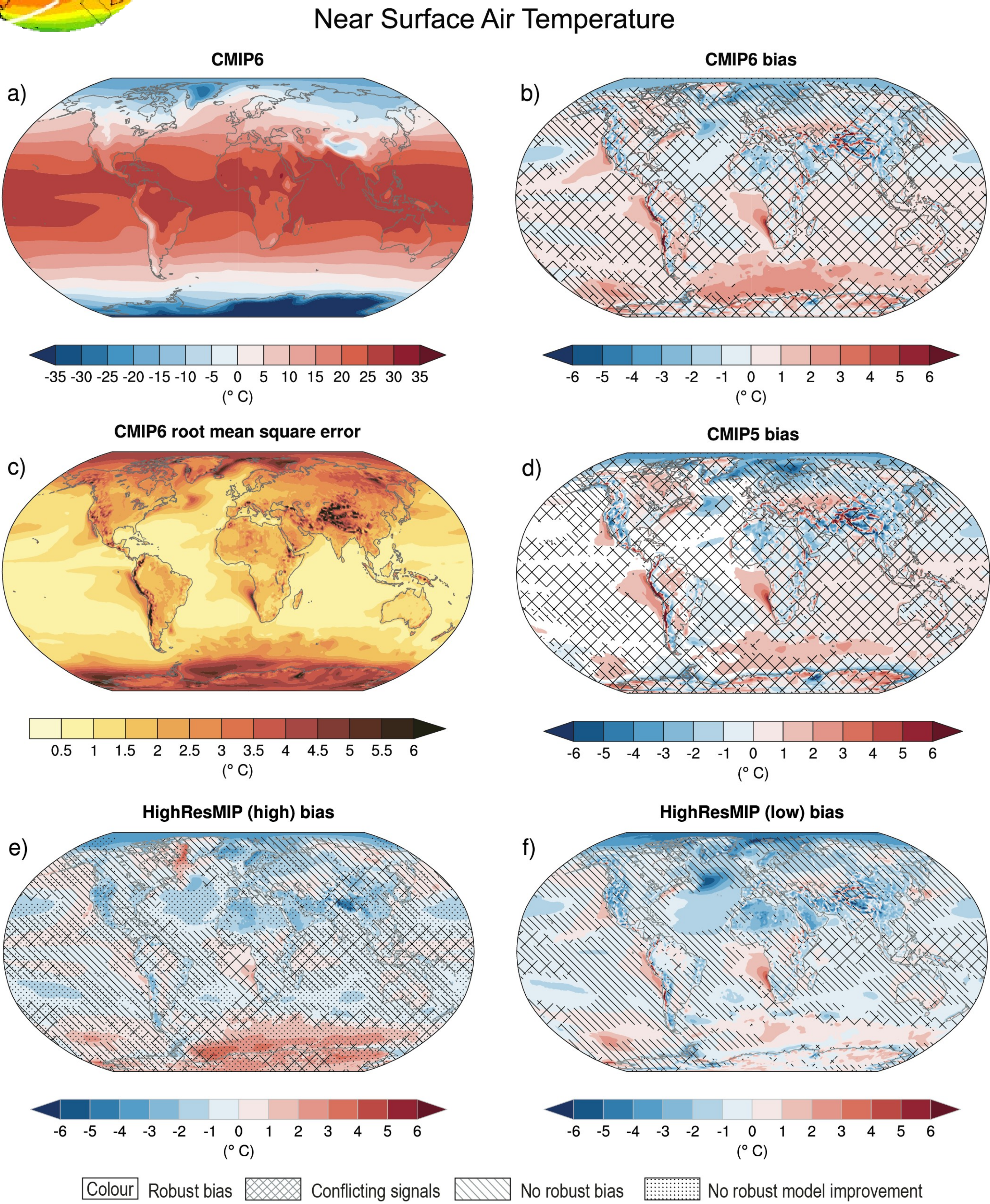
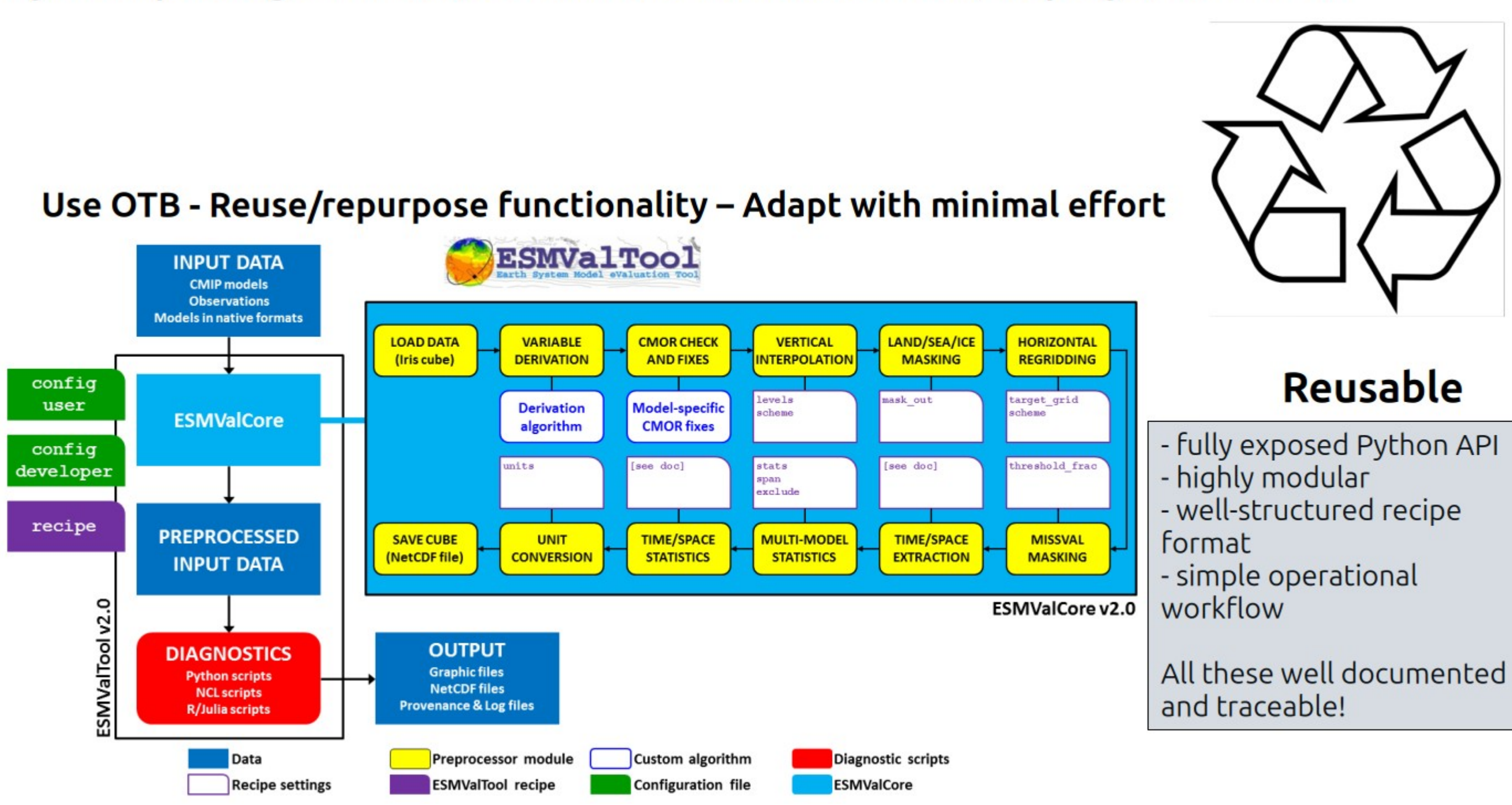
Findable Accessible Interoperable Reusable



Interoperability Input Data Standards CF/CMOR netCDF4 (CMIP5/6/7, obs4MIPs, OBS/OBS6, ana4MIPs, GRIB, CORDEX etc); allows for data CMORization **Output Data Standards** CMOR netCDF4 and W3C-PROV **Programming Language Standards** compute core in Python+DASK, diagnostics in Python, R, NCL, Julia **Infrastructure Standards** recipes and configuration in YAML, modern packaging, standard Sphinx documentation **Code quality standards** Ruff+pre-commit, integrated in CI testing **Testing Standards** 95% test coverage, multiple testing platforms, multiple OSs and Python versions; testing with bleeding edge dependencies **Versioning Standards** semantic versioning, regular releases **Deployment Standards** packaged and deployed on multiple Python package indices; containers via DockerHub; deployed on HPCs



Aspect of Accessibility	Why ESMValTool is Accessible
Open Source	ESMValTool is freely available to anyone, allowing researchers, students, and institutions worldwide to use it without licensing costs.
User-Friendly Configuration	It uses YAML recipe files, which are easier to read and edit than complex programming scripts.
Comprehensive Documentation	Detailed guides, tutorials, and examples help new users learn how to install and run the tool efficiently.
Community Support	A large international user and developer community contributes updates, answers questions, and shares solutions.
Cross-Platform Compatibility	It can run on Linux, macOS, and other computing environments, making it widely usable.
Reproducibility	Standardized workflows allow users to repeat analyses easily, improving scientific transparency and collaboration.
Modular Design	Users can choose existing diagnostics or add their own custom analyses depending on their skill level and needs.
Integration with Climate Data Standards	Supports common climate model data formats such as CMIP datasets, reducing barriers to data use.
Automation Features	Many preprocessing and evaluation tasks are automated, helping users save time and reduce technical complexity.
Scalable for Different Users	Suitable for beginners doing simple diagnostics as well as advanced researchers running large-scale evaluations.



IPCC AR6 Figure 3.3 Annual mean near-surface (2 m) air temperature (°C) for the period 1995–2014.