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Earth observations in support of the UNFCCC Paris Agreement

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Earth observations (EO), in the form of long-term climate data records, have been crucial in documenting and visualising slow changes in the climate system – from accumulating greenhouse gases, increasing surface temperatures, and rising sea-levels, to melting of every single component of the cryosphere. Yet climate change is now in our face, through increasingly intense extreme events – heatwaves, wildfires, flooding – that cost human lives and billions of economic damages, and EO can capture the impacts of such events in single images. In addition to quantifying a changing climate, EO is needed to measure progress and achievements towards the UNFCCC Paris Agreement overarching goals to combat climate change. How to translate EO into actionable information for policymakers is, however, far from clear.

This multi-directional system analysis which (to paraphrase E. F. Schumacher in *Small is beautiful*, 1973) *aimed at deriving a conceptual framework from reality, rather than deriving reality from a conceptual framework*, reveals the potential of EO to inform both mitigation and adaptation. It also highlights the role of EO in education and outreach, crucial for the empowerment of the people to demand political climate action. However, to be successful, EO science must undergo a radical overhaul: It must become more user-oriented, collaborative, and transdisciplinary; span the range from fiducial to contextual data; and embrace new technologies (e.g., Artificial Intelligence). Only this will allow for the creation of the knowledge base and actionable climate information needed to guide the Paris Agreement to a just and equitable success.