The ESA Climate Change Initiative:
Exploiting satellite archives to respond to GCOS needs

P. Lecomte, S. Plummer, S. Pinnock, C. Downy, E. Pechorro, A. M. Trofaier and A. Stefaniak
ESA Climate Office, European Space Agency, ECSAT, Fermi Avenue, Harwell Campus, Oxford, UK

Lack of understanding of many components of the Earth system limit our ability to assess what the impacts and consequences are of a change in climate. A key reason for this lack of understanding is limited global observations. To address this gap in information requires an integrated observing system comprising long-term, carefully calibrated and documented data sets of the Earth system from satellites and in situ observations complemented by numerical models to capture, understand and predict variations and trends in both space and time.

As a contribution to needs expressed by both the IPCC and GCOS, the European Space Agency initiated the Climate Change Initiative to exploit the long-term global Earth Observation archives that ESA has established over the last thirty years, in preparation for the Sentinel series of satellites. Since 2010 the CCI programme has contributed to a rapidly expanding body of scientific knowledge on 13 ECVs, demonstrating new insights in climate research. Examples include instrumental contributions to the Randolph Glacier Inventory, the first globally complete inventory of glaciers, the Ice Sheet Mass Balance Intercomparison Exercise (IMBIE), which produced a reconciled estimate of ice sheet mass balance changes in Antarctica and Greenland, and their contribution to sea level rise, improved Global Mean Sea Level estimates using Envisat data and Sea Surface Temperature and aerosols from (A)ATSR. In addition a major effort has been dedicated to unifying research teams to address ECV needs, providing an interface between the different domains: atmosphere, land, ocean and cryosphere and encouraging the interaction between the satellite teams and the wider climate research community.

The CCI products are available through the CCI Open Data Portal and the intention is that the processing systems are transferred from CCI to operational programmes, such as Europe's Copernicus Climate Change Service (C3S). While these developments represent a significant contribution to GCOS there is a pressing need to ensure the complete portfolio of high quality observational data sets are developed. Thus ESA is planning an extension of the CCI programme, CCI+, This will focus on ECVs that could not be included at the start of the CCI programme. An additional aim is to ensure that, for ECVs already included in CCI, all parameters required by GCOS are provided, GCOS requirements are met to the maximum feasible extent and all available missions contribute to the ECV data record.