## The assimilation of satellite data at ECMWF

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The long-term strategy at ECMWF calls for a continued development of a fully coupled, modular Earth-system model, comprising all components relevant for the time scales of ECMWF's missions (from medium-range to monthly and seasonal time scale). The Earth-system model will be operated at various time and spatial scales and in ensemble mode, and work towards developing coupled data assimilation within the Earth system is currently being undertaken. Data assimilation is indeed a crucial component for constraining and initializing the ECMWF NWP system and major efforts are dedicated, in collaboration with Space Agencies to maximize the exploitation of Satellite observations in this process. Over the last ten years, the increase in number of satellite data assimilated in the system has been more than ten-fold, with almost 30 million satellite observations from about 50 different instruments actively assimilated every day to initialize the deterministic and ensemble prediction system. Areas of research and development include sustained efforts to better exploit the current satellite observations (e.g. using water vapour, ozone cloud and aerosol information from advanced infrared sounders such as AIRS and IASI), swift introduction of new instruments from a variety of satellite platforms for model validation, data monitoring and assimilation, and last but not least, development of new assimilation techniques (e.g. assimilation of radiances in all-sky conditions, assimilation of compressed information from continually growing satellite data volumes via Principal Component techniques, better representation of correlated errors and flow-dependent data selection). As the components of the Earth-system model develop, satellite data are also increasingly used in the context of environment and atmospheric composition monitoring and forecasting, land surface and wave modeling, etc. This paper will describe the status of the Satellite data assimilation at ECMWF and discuss the future technical and scientific challenges and opportunities provided by the forthcoming research and operational satellites during the next decade.