An EO-driven surface model development to face global kilometre-scale Earth system monitoring challenges

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Improving the monitoring and forecasting of the thermodynamical and biogeochemical state of the Earth surface, as well as the surface-atmosphere fluxes for water, energy and carbon, is a high priority at ECMWF to improve its services for Numerical Weather Prediction (NWP) and for the European Copernicus programme.
To face future challenges for global kilometre-scale Earth system monitoring significant effort is needed to further develop the relevant surface models that can make better use of existing and new Earth observations (EO). These needs are particularly evident for mapping anthropogenic modifications of the Earth surface (e.g. land-use, water-use, urban developments mapping at ~1 km) and the effect of natural disturbances (e.g. floods, droughts, fires), as well as for separating natural and anthropogenic fluxes that are key drivers for climate-change such as carbon dioxide and methane (CO2/CH4). Examples of the EO-driven surface model developments at ECMWF and within the H2020 CO2 Human Emissions (CHE) project will be presented along with ideas for a community development effort focusing on surface modelling and mapping to fully embrace an Earth system approach at kilometre-scale.