Geophysical Research Abstracts
Vol. 21, EGU2019-14578, 2019
EGU General Assembly 2019

Hydro-JULES: Next Generation Land-surface and Hydrological Predictions

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In order to advance our ability to predict the future availability of water resources and the risk of water related disasters under a changing climate, it is necessary to bring together the land surface and hydrological modelling communities. This presentation will describe Hydro-JULES, a new research programme funded by the UK's Natural Environment Research Council. The Hydro-JULES programme will build a three-dimensional, open source, community model of the terrestrial water cycle to support and enable collaborative work across the research and academic communities in hydrology and land-surface science. An advanced terrestrial hydrological model will be generated that couples to the Joint UK Land Environment Simulator (JULES) and related models, including the UK Met Office Unified Model. This new five-year programme, is supported by NERC National Capability funding and will be delivered by the Centre for Ecology and Hydrology (CEH) in partnership with the British Geological Survey (BGS) and National Centre for Atmospheric Science (NCAS).

Hydro-JULES aims to address critical research questions in the fields of hydrology, land-atmosphere feedbacks, carbon and nutrient cycles, data science and integration with novel instrumentation and Earth observation technologies; quantify the risks of hydro-climatic extremes (e.g., floods and drought) in a changing environment to support long-range planning and policy decisions; improve hydrological forecasting using new sensors and modelling technology. The Hydro-JULES project covers topics in land-surface science and hydrology including: quantification of hydro-meteorological risks, using high-resolution climate predictions for hydrological applications, calculation the impacts of environmental change on evaporation, transpiration, and soil moisture, modelling flood inundation over large areas, representing anthropogenic interventions in the water cycle, and application of new techniques including Earth observation and data assimilation. The presentation will explore the scientific drivers for integrated land surface and hydrological modelling and outline the main elements of the structure of the work programme. We discuss the development of interfaces between components of the terrestrial water cycle to support integrated modelling of the water cycle and associated Earth system feedbacks, and describe mechanisms for community engagement and collaboration.