Table 1: Contribution of the Hydrological Ensemble Prediction Experiment (HEPEX) to Thorpex

THORPEX Goal/Research Topic	HEPEX Contribution
Global-to-regional influences on the evolution and predictability of weather system	Hydrological applications range across scales from catchments of few km^2 to continental scale. It can integrate responses over a range of variables (for example precipitation, evaporation, temperature, radiation etc) as well as across spatial and temporal scale. Hydrological systems act often as a low pass non-linear filter of atmospheric drivers. As such it can for example allow to assess *predictive skill at all forecast ranges, including potential predictability* of many near surface variables on a large range of scales. These scales are meaningful integrators of point observations and thus allow a suitable comparison to model predictions. Additionally, hydrology can act as a diagnostic *to quantify the contributions of initial condition* and *model uncertainty to forecast errors or investigate the relative effects of small and large-scale initial-condition uncertainty* and as such *develop improved global ensemble-prediction systems*. For example, many hydrological regimes can be sensitive to initial conditions and evaluate the signal of changing configurations. Additionally, hydrological models are already part of many meteorological models in the form of land surface schemes. HEPS can act as a communication platform between the traditional small scale hydrological community and the large scale hydrologists.
Data assimilation	Land surface analysis systems used in NWP are decoupled from the atmospheric analysis. They mainly rely on SYNOP data for screen level atmospheric parameters analysis (2m temperature and relative humidity) and snow analysis. Soil moisture is analysed based on screen level atmospheric parameters analysis using either an optimum interpolation approach (ECMWF, CMC, Météo-France) or a simplified EKF approach (DWD). New generations of Earth observation satellites will be suitable for NRT monitoring of land surface variables (eg SMOS, ASCAT, SENTINEL,...). They are expected to drastically increase the amount (spatial and temporal coverage/sampling) and relevance of data to be used for land surface analysis in NWP. Soil moisture and snow are of particular interest since they are at the interface between the atmospheric and the surface branches of the

	hydrological cycle. Current activities conducted in particular at ECMWF, CMC and Météo-France focus on developing the use of satellite data for soil moisture analysis. These systems are expected to be extended to snow analysis and vegetation parameters analysis in the near future. They will provide a comprehensive land surface data assimilation system suitable for the purpose of consistent NWP and hydrological forecasting.
Societal, economic, and environmental benefits of improved forecasts of high impact weather	Hydrology is important for a large range of high impact weathers such as floods, draughts, peat and forest fires etc. It allows an easy and user focused way to *identify high impact weather forecasts* and *assess the impact of improved forecast systems*. Stakeholder targeted advanced verification methods can be easily developed for example by aggregating of data to endusers targeted units, e.g. river basins, sub-units, and the development of corresponding methodologies. Hydrologists have considerable experience on aggregating, interpolation and error analysis of for example rainfall fields. An exchange of knowledge could be beneficial for both sides. A strong interface between the hydrological and meteorological community would foster applications of the meteo forecasts in hydrology and lead to *new user specific weather products*.