Seasonal forecast of the groundwater resource in France

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The Aqui-FR project is a French initiative gathering several regional hydrogeological models into a platform with the purpose of providing operational hydrological and hydrogeological real time monitoring and seasonal forecast over France. The aim is to improve our knowledge on water resources including groundwater, and to provide forecasts for a better water management.

Using atmospheric conditions from the SAFRAN meteorological analysis developed at Météo-France, the SURFEX land surface model (which solves the energy and the water balance at the surface-atmosphere interface) provides runoff and drainage fluxes to the Aqui-FR platform to estimate the groundwater resources from 1958 until now. These simulations were validated using a gauge network throughout the French territory covered by this platform (639 piezometric stations and 228 river stations).

One of the main advantages of the Aqui-FR platform is its ability to produce maps of groundwater levels and not only simulations at single locations (e.g. piezometric stations). This constitutes a great feature to get an insight of the spatial extent of a predicted drought or flood risk.

The ARPEGE System 6 seasonal forecast model, also developed at Météo-France, provides atmospheric forecasts up to 7 months in advance, containing 25 to 51 scenarios (also called members). Based on these atmospheric forecasts, the Aqui-FR platform is used to generate seasonal forecasts of the groundwater resource. These simulations are evaluated on a hindcast period (1993-2016), compared to the long run reanalysis (considered as the model reference), as well as to forecasts based on climatology (past atmospheric conditions applied to a given initial state) and to existing observations from piezometric stations.

Similarly to what is done for soil moisture or river flow, a standardized piezometric level index (SPLI) is also used. Based on a 30 year reference period of time (1981-2010), it can be interpreted as a frequency of occurrence of the groundwater level. Through this SPLI, it is then possible to provide maps of the groundwater level at each point in comparison to their respective normal levels. The number of members below or above a given SPLI threshold can also be used as an indicator of the forecast reliability for a possible drought or flood risk.

The presentation will focus on the assessment of the seasonal forecast based on the hindcast period as well as near real time forecasts of the summer 2019.