A comparison of multi-source actual evapotranspiration estimates to derive a combined dataset over Italy

Carmelo Cammalleri, Chiara Corbari, and Marco Mancini
Politecnico di Milano, Dipartimento di Ingegneria Civile e Ambientale (DICA), Milano, Italy (carmelo.cammalleri@polimi.it)

Actual evapotranspiration (ET) is one of the key quantities of the hydrological cycle, with a central role in many applications including crop water stress assessments, analysis of green water scarcity and studies on drought conditions. Due to the sparseness of ET measurements, large scale estimates are often based on models, which outputs are usually validated only on a limited number of sites. This results in a large variety in the estimates, with differences in magnitude that can limit engineering applications based on volumes. In this study, five ET datasets are compared over Italy, with the final goal to design a strategy for a robust assessment of a combined product over the climatological reference period 1991-2020 at monthly scale and at a moderate spatial resolution (i.e., 1-km). The datasets analyzed in this study include estimates from: 1) the BIG BANG water balance project; 2) the MODIS satellite product MOD16; 3) the LSA SAF product based on Meteosat; 4) the CEMS-LISFLOOD hydrological model; and 5) the SSEBop simplified surface energy balance. Preliminary results show a good spatial coherence between all the datasets over winter (DJF) and summer (JJA) – mainly driven by the marked north-south gradients during these months – but also non negligible systematic differences in the modeled ET magnitudes. A good consistency between anomaly values is also observed for many datasets. With the aim to preserve both the inter-annual variability and the temporal consistency of the time series, a strategy based on the separation between the climatological dynamic and the monthly anomalies is proposed for the combined dataset.