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Assessment of climate and vegetation indices as basin-scale water balance descriptors.

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In the general framework of regional statistical models for water resources assessment, this work explores the interaction between features of the vegetation and indices of the average climatic conditions of a basin to select the most significant and easy-to-obtain information for water balance prediction in ungauged basins. In particular, the availability of spatially-distributed remotely sensed information on vegetation dynamics can represent the demonstration of the effects of seasonal climatic features, and can support the identification of similarities among water balance processes in different areas.
The availability of large-scale databases allows us to operate our assessment on the whole Italy, starting from very simple climatic data, represented by average annual values of precipitation, temperature and relative heliophany, this latter estimated by means of satellite-derived datasets of cloudiness.
Vegetation data are examined in terms of time series of monthly Normalized Difference Vegetation Index (NDVI), computed on SPOT-VEGETATION imagery [http://free.vgt.vito.be/].
The climatic characterisation of Italy over a 1 km grid was completed by the calculation of the Budyko aridity index, for which literature methods for the estimation of net radiation were adopted to limit the ground data requirement to temperature and relative heliophany.
Based on measures of average annual water balance for a few hundred basins in Italy, for which runoff measures are available, correlations are found between climatic indices and the statistics of the annual runoff. Similarly, annual runoff statistics and mean annual NDVI demonstrate connections, except for basins with high precipita-

tion, where energy limited climatic conditions occur and NDVI is affected by a saturation effect. To go beyond the saturation problem, monthly NDVI data are processed with a Fourier analysis to provide each pixel of the grid with parameters (amplitudes and phases) that synthetically represent the timing and intensity of vegetation growth and decay.
With the final purpose of assessing if the vegetation can be a meaningful descriptor of the water balance features, we connect the Fourier amplitudes and phases to the climatic indices computed over the grid, obtaining interesting preliminary results.