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Hydrological Variations in Major River Basins of France Observed by GRACE.

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We estimated the hydrological variations in three major river basins of France : Loire, Seine and Rhone. The Loire River is the longest river in France. With a length of 1013 km, it drains an area of 117000 km^2, which represents more than a fifth of land area of France. The Seine River is length of 777 km and drains an area of 78650 km^2. The Rhone River, running through Switzerland and France, is length of 812 km with a drainage area of more 90000 km^2. We using the monthly gravity field solutions from GRACE (Gravity Recovery and Climate Experiment) at 300 km resolution. The GRACE data provided by different groups : CSR, GFZ, GRGS, ITG and JPL. The estimated water storage variations were analysed and compared with hydrological model outputs, in-situ river discharge data, precipitation, temperature and atmospheric pressure field. The amplitudes and phases of the seasonal and interannual signals of the GRACE solutions are compared with others proxy data. The results suggest that GRACE data are useful for the validation of hydrological models and for the study of water resources.