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Inter-annual gravity change from GRACE - The 2003 European heat anomaly.

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One of the most poorly observed components of the climate system is continental-scale water storage and its variations on annual to inter-annual scales. Indeed, available ground observations are generally of very small spatial or temporal scope and models driven with observed forcing seldom agree on simulated terrestrial water storage The recently launched twin satellite mission GRACE has the capability of detecting mean seasonal variations of terrestrial water storage for large river basins.

We demonstrate here the skill of GRACE data in detecting inter-annual variability in terrestrial water storage, in particular two drought events associated with record heat waves in Central Europe (2003) and western Russia (2002), using the monthly GRACE data between 2002 and 2004.

GRACE water storage changes are corroborated with indirect estimates of soil water changes based on atmospheric analysis and with in-situ observations of gravity changes using super-conducting gravimeters in Europe, both confirming the validity of these results.