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Deriving long, time-correlated global mass-flux time series from GRACE using the mascon technique

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The GRACE mission has provided an excellent view of Earth's time-variable gravity field for several years and Goddard Space Flight Center has used the K-band range-rate data directly to model this in terms of localized mascons. In particular, we have demonstrated that important information can be extracted even at the 2x2 degree cell level by applying constrained least-squares to estimate mascon parameters at discrete 10-day intervals through time. These intervals are necessarily correlated, however, due to the dynamics of the underlying mass-flux processes. Until now, we have been limited in our application of temporal constraints because of the use of direct matrix inversion schemes. However, further research has shown that the constraint system used has a useful Kronecker product decomposition, which can be exploited in an iterative inversion scheme. This allows us to correlate the mascons across all time intervals. We will present results of an analysis from April 2003 to November 2008, which entails the solution of over 2 million mascons correlated in both space and time. We will show the improvement over the restricted temporal correlation of past solutions using indicators such as ocean-bottom pressure correlation. In addition, we will show improvements due to forward modeling hydrology.