

## ***Interactive comment on “Global terrestrial water storage connectivity revealed using complex climate network analyses” by A. Y. Sun et al.***

**Anonymous Referee #2**

Received and published: 12 June 2015

The paper applies complex network approach to study connectivity patterns in the global terrestrial water storage (TWS) data. The authors use two complementary TWS data bases – Gravity Recovery and Climate Experiment (GRACE) satellite mission data and the Global Land Data Assimilation (GLDAS) NOAH model – with the resolution of 1x1 degree. The network is constructed of the land nodes (cells of 1x1 degree) that might be connected pairwise depending on the correlation of the respective TWS time series. The authors analyze several network statistics – neighbor edge density, connectivity, and connection length – to characterize the principal river basins of the World and reveal some significant teleconnections in the global water dynamics. The findings of the study are consistent with the existing climate teleconnection literature, which supports the validity of the proposed approach. At the same time, the examined way of treating TWS time series seems to be novel for this type of data and may inform

C200

a range of studies focused on the global water cycle. In addition, the study quantifies the differences between the two examined global databases, which is an important independent contribution. The paper is clearly written and effectively organized. The main conclusions seem to be valid and robust with respect to the data noise and time series processing.

There are some minor remarks, which should be easily addressed by the authors:

p. 786, ll.1-2: The sentence is unclear. What is the definition of "relevant edges"? Probably the authors refer to the nodes (not edges) that are relevant to each other? This sentence should be revised.

p. 787, ll.3-4: It is unclear what is meant by "all meaningful features". Please be more specific here.

p. 787, l.10: "correlation between edge" probably means "correlation between nodes  $i$  and  $j$ "

p. 787, l.10: Here and in other places: Please define what you mean by "correlation between time series". Is this Pearson cross-correlation at lag zero?

p. 788, Eq. (5): Do we need this? There is a lot of network statistics that are not used in this study. Why does this particular one need to be discussed with a dedicated equation?

p. 788, Eq. (6): I'm not sure that this measure can quantify "average distance between node  $i$  and all other nodes". Do you have examples or theoretical argument in support of Eq. (6) being a proxy for Eq. (5)? Importantly, this statement is probably not necessary. Why not introducing Eq. (6) as a connectivity measure used in this study, without referring to the true average distance?

p. 788, l. 12: "are included", not "is included"

p. 789, l. 3: "linear interpolation". Do you refer to linear interpolation between the two

C201

neighboring values? Do you use deterministic or stochastic linear interpolation? What if more than one value in a row is missing? Please describe this process in more detail.

p. 790, I. 24: Why using the maximum correlation coefficient is representative?

p. 791, II. 8-9, item (c): How the cutoff is related to the distribution of the correlations? (This is related to my comment immediately above)

p. 791, II. 10-11: Please explain what you mean by "all important network features"

---

Interactive comment on Nonlin. Processes Geophys. Discuss., 2, 781, 2015.