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The dynamical climate network, its major centroids, and their close relation to the ENSO cycle

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The observed relations between temperature fluctuations in different geographical regions yields a very robust climate network pattern that remains highly stable during time. Here, we break up the different elements that contribute to this stability, and quantify them [Y. Berezin, et. al., Nat. Sci. Rep. (2012)]. Due to its high stability, the climate network adjacency matrix can be regarded as a spatial field on its own right, and its typical profiles indeed have been the topic of recent studies. We have demonstrated [K. Yamasaki et. al. PRL (2008),A. Gozolchiani et. al. EPL (2008)] that during El-Nino times large portions of this field have a reduced value, corresponding to a less correlated atmosphere. We are now able to pinpoint a peculiar and rich pattern in this effect - the unique autonomous component in the eastern pacific [A. Gozolchiani et. al. PRL 107, 148501 (2011)]. In contrast to our and others earlier works, the different stages of the ENSO cycle come out as the 2 dominant K-means centroids, without pre-identification based on ENSO indices. Finally, the different feedback mechanisms which contribute to events are shown to be reflected in the network profile.