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Assessment of climate bridges in the world air traffic network using centrality measures

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In 2017 airlines carried 4.1 billion passengers. This is 7.3% more than 2016. In addition to the known side effects on the global climate, further risks are suspected, for instance, with regard to the fast spread of pathogens and infectious diseases. Within days different climate regimes are connected to each other. However, a possible relationship is hard to quantify in the real world due to missing reliable data and strong diversity.

A possible assessment of such kind of research questions can be pursued by combining open flight data, airports (nodes) and flight connections (edges), with the prevailing meteorological data. This enables to weight flights dependent on the temperature at two connected airports in a preselected fixed flight network on a daily basis. The node attributes contains geographical coordinates, population and also weather data and the weight of the edges are given in a value range [0,1] using a transfer function dependent on two temperature values. The flight connection weights are high when two high temperatures are present. The data are collected on a daily basis in a GraphML format and analyzed using the NetworkX python library. Network measures of connected airports such as the degree and the betweenness centrality can be calculated for a weighted graph in order to assess airports dependent on climate location factors and mobility. The seasonality or the long-term trend of those climate-mobility network measures at each node under recent and future climate conditions are performed.

This diagnostic analysis of climate bridges also enables to gain deeper insights into climate dynamics and teleconnections patterns.