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Network resilience to real-world disasters: Eyjafjallajökull and 9/11 OLIVIA WOOLLEY, Northwestern University, CHRISTIAN THIEMANN, DANIEL GRADY, DIRK BROCKMANN, Northwestern University — We investigate the resilience of the the world-wide air transportation network (WAN) to the 9/11 terrorist attacks and the recent eruption of the volcano Eyjafjallajökull. Although both disasters caused wide-spread disruption, the number of airports that were closed and the volume of interrupted traffic were well below the percolation threshold predicted by the classical theory. In order to quantify and visualize network deformation before breakdown, we introduce a framework based on the increase in shortest-path distance and homogenization of shortest-path structure. These real-world disasters are a new type of disruption because the removal of all vertices (airports) is geographically compact. Our framework incorporates the dual perspective of individual airports and geopolitical regions to capture how the impact interacts with the sub-network structure.We find that real-world events have an impact signature which is qualitatively different from that of random or high-centrality attacks. Furthermore, we find that the network is more resilient to the 9/11 disaster, although it removed more airports and traffic than the volcanic ash-cloud. This is due to the network roles of Europe and North America. We discuss how regional roles influence resilience to a region's removal.

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