

The RAL Seminar Series



NCAR

Are Our Air Traffic Networks Particularly Vulnerable to Spatial Hazards?

by

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Foothills Lab Building 2,
Room 1022, 1:30 p.m.**

The 2010 eruption of the Eyjafjallajökull volcano, in Iceland, had a devastating effect on the European air traffic network, with the ash cloud preventing air travel throughout most of Europe for 6 days. The severity of the disruption was surprising as previous research suggests that this network should be tolerant to random hazard. The source of this hazard tolerance in networks such as these, lies in their degree distribution (i.e. the probability distribution of nodal connections in the network). For many real world networks, such as the Internet and World-Wide-Web, this distribution has been shown to follow a power law (i.e. it is scale-free) and as such is robust to random hazard. Studies of large air traffic networks have suggested that their degree distributions either decay as a truncated power-law, or follow two power laws, meaning they too should be relatively robust to random hazard.

In this seminar, it will be demonstrated that the ash cloud was unexpectedly disruptive because it was spatially coherent rather than uniformly random. The spatial dependence of continental scale, real world air traffic networks will be presented and this will be used to demonstrate how, when exposed to spatially coherent hazard, their combined spatial and degree distributions jeopardise their inherent hazard tolerance. As many infrastructure networks have similar properties to air traffic network, they too may be vulnerable to spatial hazards such as weather phenomena.

Sean Wilkinson is a senior lecturer in the School of Civil Engineering and Geosciences at Newcastle University. He is a committee member of the UK based Society of Earthquake and Civil Engineering Dynamics and a member of the UK based Earthquake Engineering Field Investigation Team. Sean started his career as practicing structural engineer in Australia and has also practice in Indonesia. For the last 10 years he has worked at Newcastle University where he has been conducting seismic related research. His most recent research has been investigating the resilience of critical infrastructure and it is some of this work that he will be presenting.