Contagion dynamics in time-varying metapopulation networks
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DREA BARONCHELLI, City University — The metapopulation framework is
adopted in a wide array of disciplines to describe systems of well separated yet
connected subpopulations. The subgroups/patches are often represented as nodes
in a network whose links represent the migration routes among them. The connec-
tions has been so far mostly considered as static, but in general evolve in time. Here
we address this case by investigating simple contagion processes on time-varying
metapopulation networks. We focus on the SIR process, and determine analytically
the mobility threshold for the onset of an epidemic spreading in the framework of
activity-driven network models. We find profound differences from the case of static
networks. The threshold is entirely described by the dynamical parameters defining
the average number of instantaneously migrating individuals, and does not depend
on the properties of the static network representation. Remarkably, the diffusion
and contagion processes are slower in time-varying graphs than in their aggregated
static counterparts, the mobility threshold been even two orders of magnitude larger
in the first case. The presented results confirm the importance of considering the
time-varying nature of complex networks.

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