



Propagation of crises in the virtual water trade network

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The international trade of agricultural goods is associated to the displacement of the water used to produce such goods and embedded in trade as a factor of production. Water virtually exchanged from producing to consuming countries, named virtual water, defines flows across an international network of “virtual water trade” which enable the assessment of environmental forcings and implications of trade, such as global water savings or country dependencies on foreign water resources.

Given the recent expansion of commodity (and virtual water) trade, in both displaced volumes and network structure, concerns have been raised about the exposure to crises of individuals and societies. In fact, if one country had to markedly decrease its export following a socio-economical or environmental crisis, such as a war or a drought, many -if not all- countries would be affected due to a cascade effect within the trade network. The present contribution proposes a mechanistic model describing the propagation of a local crisis into the virtual water trade network, accounting for the network structure and the virtual water balance of all countries. The model, built on data-based assumptions, is tested on the real case study of the Argentinean crisis in 2008-09, when the internal agricultural production (measured as virtual water volume) decreased by 26% and the virtual water export of Argentina dropped accordingly. Crisis propagation and effects on the virtual water trade are correctly captured, showing the way forward to investigations of crises impact and country vulnerability based on the results of the model proposed.