# Climate Meets Complex Systems: Exploring Teleconnections in the Climate System via a Complex Network Approach

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The Earth system is a very complex and dynamical one basing on various feedbacks. This makes predictions and risk analysis even of very strong (sometime extreme) events as floods, landslides, heatwaves, and earthquakes etc. a challenging task. After introducing physical models for weather forecast already in 1922 by L.F. Richardson, a fundamental open problem has been the understanding of basic physical mechanisms and exploring anthropogenic influences on climate. A highlight was the pioneering studies by Hasselmann and Manabe who got the Physics Nobel Price in 2021. I will shortly review their main seminal contributions and discuss most recent challenges concerning climate change.
Next, I will introduce a recently developed approach via complex networks mainly to analyze long-range interactions in the climate system. This leads to an inverse problem: Is there a backbone-like structure underlying the climate system? To treat this problem, we have proposed a method to reconstruct and analyze a complex network from spatio-temporal data. This approach enables us to uncover teleconnections among tipping elements, in particular between Amazon Rainforest and the Tibetan Plateau, but also between the Arctic and Southwest China and California. Implications of these findings in particular for forecasting extreme events are discussed.