

A global tropical cyclone model

Supervisor: Ralf Toumi (Department of Physics/Grantham Institute)

Tropical cyclones (also called Hurricanes and Typhoons) are one of the most dangerous natural hazards with approximately 1 billion people exposed to them and very substantial economic damages. They are expected to become even more damaging in the future (1). Much about their fascinating genesis, intensification and decay remains insufficiently understood. All atmospheric physics processes affect tropical cyclones: dynamics, thermodynamics, radiation. The current generation of climate models do not simulate the strongest and most damaging storms, which makes future projections very uncertain. An alternative is a special class of simulations using synthetic or stochastic models which are extremely powerful for risk assessments needed by the public and private sectors.

The new Imperial College Storm model (IRIS) is such a state-of-the-art stochastic model which is also constrained by physics (2). It can be used to study long-term climate change impacts of tropical cyclones as well as the inter-annual influence of the Pacific El Nino oscillation. A very important application of IRIS is the attribution of economic damages to climate change which have only just started and this project will improve (3). It is important to understand this attribution to prepare better for these storms. In this project you will develop the IRIS model further and join the largest research group in Europe working on tropical cyclones.

Contact: Prof. Ralf Toumi, r.toumi@imperial.ac.uk

1. <https://www.annualreviews.org/doi/abs/10.1146/annurev.earth.31.100901.141259>
2. <https://www.nature.com/articles/s41597-024-03250-y>
3. <https://www.imperial.ac.uk/grantham/research/climate-science/modelling-tropical-cyclones/>