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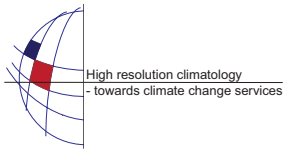

An assessment of the ECMWF tropical cyclone ensemble forecasting system and its use for insurance loss predictions

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Tropical cyclones (TC) are amongst the most impressive and destructive weather systems of Earth's atmosphere. The costs related to such intense natural disasters have been rising in recent years and may potentially continue to increase in the near future due to changes in magnitude, timing, duration or location of tropical storms. This is a challenging situation for numerical weather prediction, which should provide a decision basis for short term protective measures through high quality medium range forecasts on the one hand. On the other hand, the insurance system bears great responsibility in elaborating proactive plans in order to face these extreme events that individuals cannot manage independently.

Real-time prediction and early warning systems are needed in the insurance sector in order to face an imminent hazard and minimise losses. Early loss estimates are important in order to allocate capital and to communicate to investors.

The ECMWF TC identification algorithm delivers information on the track and intensity of storms based on the ensemble forecasting system. This provides a physically based framework to assess the uncertainty in the forecast of a specific event.

The performance of the ECMWF TC ensemble forecasts is evaluated in terms of cyclone intensity and location in this study and the value of such a physically-based quantification of uncertainty in the meteorological forecast for the estimation of insurance losses is assessed. An evaluation of track and intensity forecasts of hurricanes in the North Atlantic during the years 2005 to 2009 is carried out. Various effects are studied like the differences in forecasts over land or sea, as well as links between storm intensity and forecast error statistics.

The value of the ECMWF TC forecasting system for the global re-insurer Swiss Re was assessed by performing insurance loss predictions using their in-house loss model for several case studies of particularly devastating events. The generally known problem of the intensity bias in tropical cyclone forecasts is a very critical aspect, when using the meteorological forecasts for insurance loss prediction in such a chain modelling approach.