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The RMS Hurricane-Rain Model

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Tropical cyclones (TC) threaten human lives and properties due to strong winds (which can also cause storm surges) and torrential rains. The strongest ever observed rains with durations of several hours to several days result from strong land falling tropical cyclones. Single events like the tropical cyclone Allison (2001) can cause damages of several billions of US$ due to precipitation even if their wind speed does not reach hurricane strength.

Risk Management Solutions ltd. (RMS) has nearly 20 years experience in providing most accurate risk estimates related to a broad range of natural hazards based on state-of-the-art natural science. In order to estimate the flood risk due to extraordinary rains from tropical cyclones RMS has developed a Hurricane-Rain Model based on stochastic storm tracks, parameterized thermodynamic and cloud microphysical processes as well as observed rain data. This presentation introduces the RMS Hurricane-Rain Model and discusses its quality.

Over the ocean, rain from tropical cyclones results from both, deep convection in the spiral rain bands as well as stratiform clouds. This leads to nearly axisymmetric precipitation patterns. After landfall, however, orographic lifting and surface roughness changes can alter the precipitation footprint of a tropical cyclone considerably. Furthermore, strong horizontal winds of a tropical cyclone lead to considerable rain drifts. Finally, the longer a hurricane stays over land the more it gets filled, i.e. winds calm down, central pressure increases and rain rates decrease.

The RMS Hurricane-Rain Model consists of parameterizations of all these processes within a Lagrangean frame in order to estimate local instantaneous rain rates. The

latter are accumulated over periods of interest. They are entered into a flood model in order to estimate resulting floodings.

The model is calibrated with respect to land falling hurricanes in the US and with respect to a gridded precipitation dataset based on observations (0.25 degrees resolution). The model runs fast enough to allow for the estimation of hurricane rains based on a stochastic hurricane track set. Thus it is the basis for estimating the local risk of damage due to flooding caused by torrential hurricane rains.