Atmospheric models with grid spacing coarser than O(100 m) have to parameterize most aspects of the flow, including turbulence, shallow and deep convection. The latter parameterizations have been shown to be a bottleneck for the simulation and understanding of climate processes in strongly convective regions. Here this bottleneck is avoided by explicitly resolving most part of the flow over large domains, in the order of 350’000 km2. The methodology follows the approach pioneered in the HD(CP)2 project, where large-eddy simulations have been performed over Germany and over the tropical Atlantic for selected days. The methodology is here applied to a region of very distinct meteorological and surface conditions: the maritime continent and the East Asian summer monsoon region. The goals of the project are to evaluate the cloud-resolving modelling approach in such a sophisticated environment and to investigate basic features of convective and cloud processes in view of the representation of the monsoon system.
The project will perform a two month convection-permitting simulation with a grid spacing of 2.5 km encompassing the region 90°E-160°E,10°S-40°N. This simulation will be used to drive the large-eddy simulations over selected domains. Attention will be given to the ability of large-eddy simulations to reproduce the moisture budget over the maritime continent as well as the land to ocean precipitation ratio as function of island size. Large eddy simulations at grid resolution of O(100m) will be performed over the middle and lower reaches of Yangtze River (108oE-121oE, 27oN-33oN), which corresponds to the core region of Meiyu rainbelt. Efforts will be devoted to the performances of large-eddy simulations to reproduce the structure of Meiyu front, precipitation diurnal cycle, and monsoon clouds. This will allow us to assess the strengths and weaknesses of large-eddy simulations in reproducing key ingredients to the monsoon system: the land-sea contrast in precipitation, the representation of moisture budget, the occurrence of extreme precipitation events, and the vertical structures of clouds. The implementation of the proposal will push two nations’ research at the forefront of international efforts to harness new breakthroughs in high resolution modelling of tropical convections and monsoons.