



Rediscovering the doldrums in high resolution simulations of the tropical Atlantic

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When sailors started crossing the tropics, they quickly discovered and learned to fear the belt of calm and variable winds around the ITCZ. They named this region the doldrums. The doldrums are such a persistent and dominant part of the general circulation that they were marked and described in the earliest maps and studies concerned with the winds over the oceans. After the invention of steam ships the interest in the doldrums faded and the doldrums mainly lived on in colloquial language as an expression for stagnation, listlessness and depression describing the experience of the sailors rather than the region. The research focus shifted to the ITCZ, which describes more the position of a variable front of strong convergence and maximum precipitation residing in the doldrums. GCMs continue to correctly simulate the position of the ITCZ, which is partly determined by small scale processes which are parameterized.

In support of the NARVAL measurement campaign, convection permitting simulations were conducted for a winter and a summer months covering the tropical Atlantic (9000x3300 km) with the Icosahedral Nonhydrostatic Model (ICON). These simulations reveal the doldrums with their embedded convective structures including cold pools, convective storms and squall lines. The calms and the high variability of the wind direction between the trades connected to convective activity in the ITCZ is presented using the high resolution simulations and are compared to historical and current observations. Comparisons with current NWP models using parameterized convection show that parameterized models struggle to reproduce some of the essential features connected to the doldrums.