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The TRR181 “Energy Transfers in Ocean and Atmosphere” – Overview and plans for phase III

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Energy does not “vanish”— the energy of a closed system is steady. It is not lost but rather converted into other forms, such as when kinetic energy is transferred into thermal energy or vice versa heat results in a force. However, this fundamental principle of natural science is often still a problem for climate research. For example, in case of the calculation of ocean currents, where small-scale vortices as well as mixing processes they induce need to be considered, without fully understanding where the energy for their creation originates from. This is similar in the atmosphere, the only difference being that air is moving instead of water. Again, local turbulences can drive larger movements or vice versa waves on a larger scale can disintegrate into small structures. All these processes are important for the Earth’s climate and determine how temperatures will rise in the future.

How exactly the energy transfer between waves, eddies and local turbulences in the ocean and the atmosphere works, often remains unclear. The interdisciplinary project „Energy Transfers in Ocean and Atmosphere“ (DFG TRR181) wants to change this: oceanographers, meteorologists and mathematicians from Hamburg, Bremen, Rostock and Frankfurt work closely together to achieve this goal (see participating institutions). The aim is to develop energetically consistent mathematical models and thus enhance climate analyses and forecast accuracy. The TRR181 has recently been awarded a third phase. In this talk, I give an overview of the TRR, and the planned research for the next 4 years, with focus on the Bremen contributions.