

Séminaire

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The coupled ocean-atmosphere hydrothermohaline circulation

The ocean thermohaline circulation is in the present work linked to the hydrothermal circulation of the atmosphere. The ocean thermohaline circulation and the atmosphere hydrothermal circulation are generally analysed as two separate systems although they interact with each other at the surface between the atmosphere and the ocean. We will in the present work analyse and thus visualise how the ocean and atmosphere are acting as a number of overturning cells, expressing the mixing of air and water masses. In order to do so we will use two recently introduced stream functions, one for the ocean and one for the atmosphere. The ocean thermohaline stream function, makes it possible to analyse and quantify the entire world-ocean conversion rate between cold/warm and fresh/saline waters in one single representation. The atmosphere analogue is the hydrothermal stream function, which instead captures the conversion rate between cold/warm and dry/humid air in one single representation. We will in the present study combine and also try to merge the overturning analyses of the ocean and atmosphere. In order to do so we have explored and used different ways to relate the salinity of the ocean and the humidity of the atmosphere, which have been used in the past. By using simulations integrated with the Climate-Earth system model EC-Earth, we have succeeded to produce the hydrothermohaline stream function of the coupled ocean-atmosphere overturning circulation in one single picture. This shows how the atmospheric hydrothermal cell and the ocean thermohaline Conveyor-Belt cell are closely linked to each other along a "line" corresponding to the Clausius-Clapeyron relationship.