



## The tropical atmospheric conveyor belt: a Lagrangian perspective of the large-scale tropical circulation

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The Hadley circulation (HC) is a key element of the climate system. It is traditionally defined as the zonally averaged meridional circulation in the tropics, therefore treated as a zonally symmetric phenomenon. However, differences in temperature between land and sea cause zonal asymmetries on Earth, dramatically affecting the circulation. The longitudinal dependence of the HC evokes questions about where and when the actual large scale tropical circulation occurs. In this study, we look into the connection between the longitudinally dependent HC and the actual large scale movement of air in the tropics using a coupled Eulerian and Lagrangian approach. Decomposing the velocity field, we identify the components affecting the actual circulation. In addition, we calculate trajectories of air parcels to analyze the actual movement. We propose an alternative definition for the circulation, that describes the actual path of air parcels in the tropics, as a tropical conveyor belt. The Indo-Pacific warm pool is the driver of the circulation, where air converges and ascends, then moves westward and poleward before entering the jet stream, moving eastward with it, eventually beginning its descent near the Americas. Furthermore, using an idealized moist GCM, we explore how tropical asymmetries affect the circulation and discuss the possible mechanisms controlling the tropical conveyor belt.