

Abstract

Will solving the “Angular Momentum Paradox” explain the Subtropical Jet Stream?

A popular way to understand the general circulation has for long times been to consider air moving meridionally. The first attempts in the 1700's assumed that the air's absolute velocity was conserved. This yielded fairly correct wind directions but unrealistically high winds. When this erroneous principle was replaced by the correct principle of conservation of angular momentum in the mid 1800's the excessive wind speeds paradoxically doubled in strength.

This “Angular Momentum Paradox” has troubled meteorologists for 150 years, from Heinrich v. Helmholtz and Julius v. Hann, in the 1800's to Isaac Held and James Holton in our days. See pages 59-78 in [Lorenz WMO Monograph](#).

The “Paradox” has led to opinions that the subtropical jet stream is not well understood (e.g. Wiin-Nielsen-Chen) and questions why it is not stronger (e.g. Hartmann). Five different rather strained explanations have been presented to solve the “paradox”, none really satisfying. These problems have led some scientists to doubt if angular momentum is at all a useful concept in this context.

The seminar will show that there are no generation of excessive winds, in fact no wind increase at all and thus no “Paradox”!. The angular momentum approach can indeed be successfully used to shed light on the atmospheric large-scale circulation in general and the subtropical jet stream in particular - providing the physical conditions under which the air is set in motion are made slightly more realistic.