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Preface to Part 1

This issue of Dynamics of Atmospheres and Oceans (DAO) is the first of a two-part special issue devoted to the subject of the general circulation of the atmosphere. My original motivation was to offer scientists, some having long standing in the field, the opportunity to summarize the current state of knowledge about the general circulation in well-defined areas. However, DAO is not a review repository but a periodical devoted to publishing original research. The compromise was to ask authors to pair a longer than usual overview with an original work related to a specific topic.

The authors were given license to decide what qualifies as part of the general circulation. Though a broad umbrella, the subject of the general circulation does abstract only a portion of the total circulation of the atmosphere. Typically the totality of the atmosphere is passed through some type of low pass filter. Different people choose different filters. To some people, the general circulation may be synonymous with the longitudinal (zonal) average circulation. To others it may mean all the scales larger than some length (in space and or time). Strictly speaking it could be restricted to motions and not include mass, temperature, or other fields. The authors of this special issue adopt the broader perspective that encompasses all things directly linked to some aspect of the larger scale circulations that persist in the climatological record.

Potential authors were invited to cover specific subjects based on their expertise, some chose a slightly different topic. Also, I could not enlist an author for some subjects leading to some unevenness of the subject coverage. Having diverse voices about what should be covered and how is a strength of this collection. The first paper is intended to provide a context for what follows by deducing basic properties of the general circulation from a few fundamental physical principles and a few empirical facts; a challenge is to match the fundamentally different circulations of the tropics and midlatitudes. The second article traces historical thoughts about the equatorial zonal divergent circulations with a caveat about deducing the divergent circulation from the total wind. The third article examines the larger scale factors (including the Indian ocean zonal circulation) that influence east African rainfall during the transition between boreal summer and winter. The fourth article bridges the first two tropical subjects and the following two middle latitude eddy subjects by examining how the tropics interact with higher latitudes through upper level long waves originating in midlatitudes and subsequent tropical plumes; observed properties are analyzed in the context of various theories, and modeling works. The fifth article identifies several properties of the midlatitude storm tracks then introduces a single-layer model that appears to capture some of those properties. One such property is the midwinter suppression of cyclones in the north Pacific (unlike the Atlantic), a topic of prime focus in the sixth article. The sixth article compares

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the two Northern Hemisphere storm tracks in observations and two models; their work reveals greater barotropic damping in midwinter associated with the stronger jet stream which may be a key factor and they also discuss a role for diabatic processes. The seventh paper focuses on the exchange of angular momentum across the tropopause, finding that the zonal mean exchange of momentum is concentrated in the tropics with meridional transports towards or away from that region.

In the second part, additional subjects related to the general circulation will be covered.

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