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Relation between variations in the intensity of the zonal circulation of the atmosphere and the displacements of the semi permanent centers of action

by C.-G. Rossby and Collaborators

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EDITOR'S COMMENTARY

Rossby waves! Beta-plane!

Here Carl-Gustav Rossby, motivated by observations of weather patterns that move upstream relative to the dominant mid-latitude eastward wind flow, formulates a completely novel linearized theory to account for the tendency for large-scale disturbances to move westward and smaller-scale disturbances to move eastward relative to the winds.

We now recognize this solution as the Rossby wave. Although the expressions here describing these waves look foreign to us now, this is partly a matter of notation and partly that Rossby only considered waves propagating strictly east- west, with no possible meridional propagation. Along the way, he introduces and rationalizes the now ubiquitous beta-plane—"β"—a term compactly representing the latitudinal variation of effective rotation rate—that is, the effect of a spherical Earth.

Both Rossby waves and the beta-plane are well-used tools known to anyone studying ocean or atmospheric dynamics. Rossby's understanding of these two related effects has since opened countless doors in oceanographic research.

—Kenneth H. Brink