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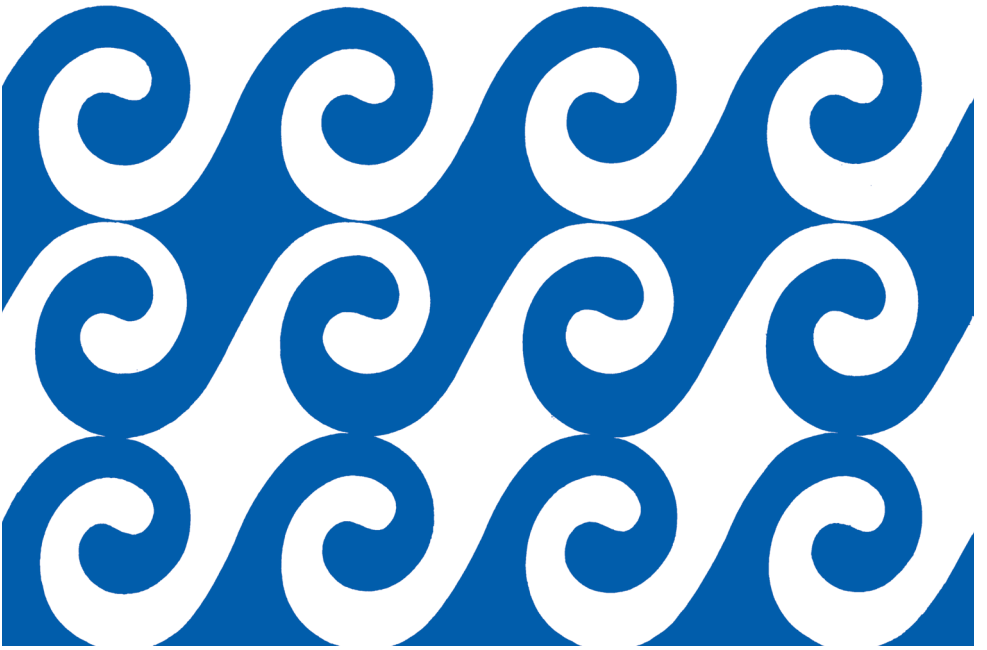
JOURNAL OF MARINE RESEARCH



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Journal of Marine Research Classic Articles

On the mutual adjustment of pressure and velocity distributions in certain simple current systems[1]

On the mutual adjustment of pressure and velocity distributions in certain simple current systems, II[2]

by C.-G. Rossby

EDITOR'S COMMENTARY

These are the original geostrophic adjustment papers. Rossby starts out by asking what, if anything, limits the ability for a flow to be in geostrophic balance (to precisely follow pressure contours on a rotating planet). This topic is now a classroom standard, but we often forget how insightful the original articles are. Three interesting aspects of these papers are:

—Rossby introduces the seemingly ubiquitous "radius of deformation," a length scale (given by the long gravity wave speed divided by the Coriolis parameter) that crops up in virtually any problem involving a horizontally divergent flow on a rotating planet. It is instructive to read how Rossby chose the name.

—Rossby points out that momentum will be transferred downward in a stratified ocean, so that we should never expect the deep ocean to be quiescent. This more than a decade before the landmark Swallow and Crease (Crease 1962) experiment demonstrated this in the real ocean.

—The articles foreshadow the yet-to-be-discovered theory of baroclinic instability, which, in nature, limits how strong a geostrophically balanced vertical shear can become and, in the process, creates weather in the atmosphere.

These papers are classics, still enlightening more than 80 years later.

[1]Originally published November 17, 1937, in the *Journal of Marine Research* 1(1), 15–28.
[2]Originally published September 30, 1938, in the *Journal of Marine Research* 1(3), 239–263.

Carl-Gustaf A. Rossby on June 3, 1939, when he was named Assistant Chief for Research and Education of the United States Weather Bureau in Washington, D.C. For this post, Rossby was granted a three-year leave of absence from his faculty position at the Massachusetts Institute of Technology. Library of Congress Prints and Photographs Division, Washington, D.C. 20540; Harris & Ewing photograph collection; https://www.loc.gov/pictures/item/2016875745/.

Carl-Gustaf Rossby (1898–1957) was indeed a seminal figure in the fields of dynamical meteorology and oceanography. Born in Sweden, he studied at Stockholm and in Bergen, Norway, with Vilhelm Bjerknes (noted, among other things, for his leadership in developing quantitative weather forecasting). After that, Rossby held a remarkable sequence of academic and governmental positions, including with the Massachusetts Institute of Technology, the Woods Hole Oceanographic Institution, and the University of Chicago. He spent his final years in Stockholm where he became engaged in atmospheric chemistry.

Rossby is responsible for several fundamental developments in the study of dynamics of fluids on a rotating planet. He is perhaps best known for "Rossby waves": large-scale disturbances that exist because of the conservation of vorticity on a rotating planet. His original inspiration for the development of this idea was the motion of atmospheric weather systems, although the concept is similarly useful in study of the ocean. In addition, his "geostrophic adjustment" model provided key insights on the nature of large-scale flows

and their natural scales. The "Rossby number," the accepted measure of the importance of nonlinear fluid processes on a rotating planet, is also named for him.

Rossby's intellectual and practical accomplishments brought wide recognition, including in 1956 becoming the first meteorologist pictured on the cover of *Time* magazine.

—Kenneth H. Brink

REFERENCES

Crease, J. 1962. Velocity measurements in the deep water of the western North Atlantic: Summary. J. Geophys. Res. *67(8)*, 3173–3176. https://doi.org/10.1029/JZ067i008p03173.