The global ocean circulation: an elegant dynamical system

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The global ocean circulation is a complex three-dimensional flow generated by momentum fluxes (wind stress) and buoyancy fluxes at the ocean-atmosphere interface. An understanding of the properties of the time-mean flow and the internal variability of the circulation can only be accomplished by using a hierarchy of models. To systematically study the solutions of these models, the relations between these solutions over the model hierarchy, and their connection to observations, techniques of numerical bifurcation theory have shown to be very useful. In this lecture, I will give an overview of the rather elegant structure of the different solution regimes known so far. In addition, the use of this structure in attributing physical mechanisms to observed phenonema will be illustrated for a particular example.