As Vallis himself asserts, at least the early parts of the book are actually a treatise in ‘geophysical fluid dynamics’ (GFD) – a term first coined in the 1950s originally to mean the fluid dynamical fundamentals underlying meteorology and oceanography, and even adopted by Joseph Smagorinsky, the founder of NOAA’s atmospheric modelling research group in Princeton, into the title of the laboratory in 1963. More recently, however, this term has been widened to include the dynamics of volcanoes, magma flows, planetary interiors and even space plasmas.

Speaking as a GFD practitioner, it is somewhat disappointing that Vallis himself evidently regards ‘GFD’ as a subject that is rather austere, theoretical and ‘dry’ – the latter quality he regards as ‘best reserved for martinis and humour’ – that demands an ascetic approach reminiscent of monastic discipline! Yet he himself has clearly devoted enormous intellectual energy, enthusiasm and insights into his expositions of basic processes in atmospheric and oceanic dynamics.

His discussion of potential vorticity, for example, is full of insight and clarity, covering both kinematical and geometrical aspects. The chapters on instabilities and wave–mean flow interactions are masterly in the clarity of their presentation and are very comprehensive. The book also deals nicely with the principles underlying the parametrization of eddy transports – vital for modern ocean models and being rediscovered in the context of atmospheric science. The only areas where I felt I began to part company with him was in some aspects of his discussion of geostrophic turbulence, where his assertion of the ‘Rhines barrier’ to upscale energy cascades does not quite reflect some of the most modern thinking in this area. But this is a small issue in what is otherwise an impressive and comprehensive treatment.

The only somewhat negative aspect that struck me on reading this book was that it presents relatively little in the way of real observations of the atmosphere or oceans, or even illustrative laboratory experiments with which to compare against the elegant theoretical results expounded at length throughout the book. This tends to convey an impression of the subject that is disconcertingly precise and ‘tidy’ – free of any hint of the ‘suffocating detail of the real world’. To include this extra dimension in the present book would, of course, add substantially to what is already a very weighty tome. But this dimension could perhaps eventually be added via the book’s website (http://www.vallisbook.org/)? The latter is certainly highly commendable as a potentially valuable (and easily updated) resource, though it is as yet somewhat underdeveloped, containing to date only copies of the book’s illustrations, together with a set of errata, a few internet links and solutions to some of the
problems. It is slightly surprising to see so few of the problems with solutions offered (with appeals to readers to provide additional solutions), leading one to wonder how many of the problems have actually been through the fiery trials of student experience.

As stated in the preface, the book is intended to be accessible to beginning graduate students, while also serving as an introduction to scientists in other fields and as a reference for atmosphere–ocean professionals. In these aims it is clearly very successful, and is sure to grace the shelves of libraries and (at CUP’s remarkably reasonable price for such a large hardback volume) even individuals for many years to come, both as a reference and a tutorial text.

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