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The Gulf Stream

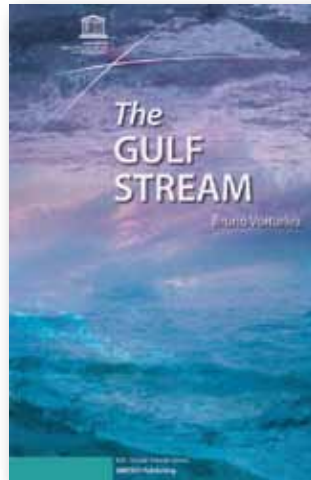
By Bruno Voituriez, IOC Ocean Forum Series, UNESCO Publishing, 2006, 223 pages, ISBN 9231039954, Paperback, \$22.50

REVIEW BY BRUCE A. WARREN

Apparently provoked by some of the current claptrap in the popular media, Bruno Voituriez has written this book, for a general audience, about “the history of the discovery of the Gulf Stream and its science.” His scope is actually much broader, extending to the climatology and paleoceanography of the North Atlantic. He makes three good points; otherwise the book falls short.

First the good points. He disposes of the myth that the Gulf Stream warms northwestern Europe. The air over Britain is warmer and wetter in winter than that over Labrador because Britain is downstream of it in the westerlies; the cold, dry air blowing out of Siberia and Canada is heated and dampened by air-sea exchanges as it passes over the Atlantic, so Britain experiences a maritime climate, but Labrador a continental one. The Gulf Stream has little to do with it. Voituriez draws a nice parallel with the zone of westerly winds in the North Pacific: the wintertime air over British Columbia is warmer and more humid than that over Kamchatka, but no one supposes that this contrast, corresponding to that over the North Atlantic, is due to the Kuroshio Extension, which lies far to the south.

Second, he refutes nonsensical talk that the Gulf Stream might “stop” or “shut down.” The Gulf Stream is driven



by the pattern of winds over the North Atlantic (easterlies in low latitudes, westerlies in middle latitudes), and so long as the earth rotates, and the sun heats it differentially, and the continents stay in place, this pattern will endure. Regardless of what happens to the density of surface water in the subpolar and polar North Atlantic, there will always be a Gulf Stream.

As a corollary to these two points, Voituriez argues that the Gulf Stream has only a minor role to play in climate variation. It is much less likely to be an agent of change than an object of forcing by other elements of the climate system.

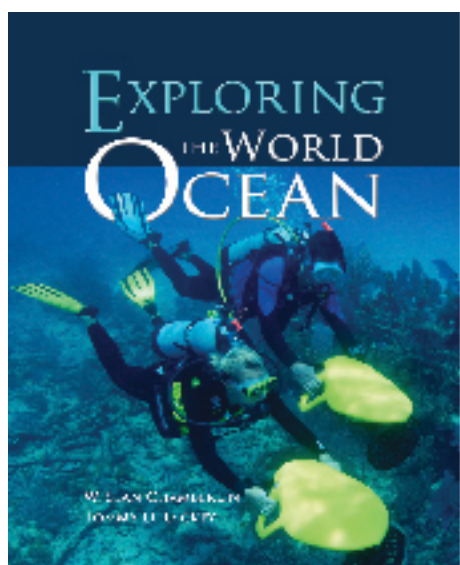
After an introduction, the main text begins with a chapter on “The Scientific History of the Gulf Stream.” Voituriez repeats the canard that Prince Henry planned and organized the progressive southward exploration of the west coast of Africa by the Portuguese, and he insists that Columbus’s enterprise was more to discover islands between Europe and Asia than to reach the Indies. In other respects his narration matches the first chapter in Stommel’s *The Gulf Stream*, with additional material about some technological developments in the

latter part of the twentieth century.

The chapter “What is the Gulf Stream?” deals with nomenclature (what segment of the North Atlantic circulation is to be called “Gulf Stream?”) and dynamics. Fluid motions in rotating systems are non-intuitive, and it is difficult to explain them to non-practitioners. It can be done, though, as Stommel did in *A View of the Sea*; but Voituriez fails. His presentation is mostly wrong, and often incomprehensible. Physical oceanographers will be dismayed by it; general readers, baffled.

The central (and longest) chapter, “The Gulf Stream and the Earth’s Climate,” is largely about climate. Voituriez is beguiled by the trendy, inept metaphor, “conveyor belt.” This is a way of imagining the so-called thermohaline circulation, not a description of it; and it misleads. The metaphor contains no dynamics, it misrepresents the circulations, vertical transports, and property fluxes in the ocean, and it promotes no useful research. It is easy to grasp, though, and some people with little physics or familiarity with the oceanic velocity field do grasp at it. But it is just a pretty fancy; there are no “conveyor belts” in the ocean.

And then there is the North Atlantic Oscillation, of which Voituriez is also fond. It is not actually an “oscillation” (a “wobble” perhaps?), but an irregular time series of atmospheric pressure difference (Iceland–Azores) with a long-term mean subtracted from it. To make an NAO Index, the time series is normalized in such a way as to lose the physical magnitudes of the pressure differences, and it is filtered to an author’s taste. Time series of oceanographic parameters are then plot-



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ted in parallel with the Index, to display, perhaps with time lags, correlations of varying impressiveness. Qualitative casual mechanisms are suggested, but no quantitative examination of how the NAO pressure-difference variations might act on the ocean seems to be done (variations in Ekman flux? in Sverdrup transport? in strength of air-sea exchanges? in location of line of zero wind-stress curl? in something else?). It is not Voituriez's fault that the NAO Index is, as yet, such a dissatisfying explanatory device: this is how it is presented in the literature.

He goes on in the same chapter to discuss "great salinity anomalies," the Milankovitch Cycle, Heinrich Events, Dansgaard-Oeschger cycles, the Younger Dryas, greenhouse gases. There is much waving of the hands throughout this chapter. At one point (p. 115) Voituriez admits, disarmingly, "the reader will probably think that things are not clear." Yes indeed.

He then digresses into a chapter on ecological regimes, and concludes the book with a look toward future research. This is presented in the framework of international committees and acronymic programs. They seem necessary for funding research these days, though the lack of explicit concern here for the insights and ideas of smart people on which all good science depends is a bit disheartening.

There are many, many small errors all through the book—far too many to list in a review, and far too many, following what has already been said, for this reviewer to recommend it (despite the good points). One error strikes too close to home to pass over: the Woods Hole Oceanographic Institution was *not*

"created almost exclusively to study the Gulf Stream" (p. 133), as even a glance at the WHOI Collected Reprints from the 1930s reveals.

Voituriez uses some non-standard nomenclature: "Norway Current," "West Indies Current" for the Antilles Current, "Slope Sea" for the slope water. The figures have been reduced so much that the labeling on some is hard to work out. At least one figure (20b) is misattributed. And there is no index.

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