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Gas transfer through the air-water interface in LES of Langmuir circulation in shallow water CIGDEM AKAN, ANDRÉS E. TEJADA-MARTÍNEZ, University of South Florida — Over the past century the study of gas exchange rates between the atmosphere and the ocean has received increased attention because of concern about the fate of slightly soluble, greenhouse gases such as CO_2 released into the atmosphere. Of recent interest is the oceanic uptake of CO_2 along US shallow water coastal regions (e.g. see http://www.nacarbon.org). We present surface gas transfer results from large-eddy simulation (LES) of wind-driven shallow water flow with and without wave effects. Wave effects, parameterized by the well-known Craik-Leibovich vortex force, lead to the generation of Langmuir circulation (LC), serving as a mechanism for surface renewal of low concentration fluid. Our computations are motivated by the infrared imagery of Marmorino et al. (2004) suggesting that LC can affect gas transfer across the surface through straining and stretching of the gas concentration boundary layer. Preliminary LES shows that shallow water LC can increase the surface gas transfer rate by about 30 percent. Here we will focus on the accuracy of surface renewal models in predicting gas transfer velocity, a measure of gas transfer efficiency, in the presence of LC. Gas transfer velocity predicted by the surface renewal models will be compared to the prediction obtained directly from the LES.

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