

Ocean carbon cycle feedbacks on climate dominated by surface ocean chemistry (Revelle Factor) feedbacks

*Keith Bradley Rodgers¹

1. Princeton University

There are two long-standing threads of research regarding the role of the ocean carbon cycle in contributing to climate feedbacks. Originally it was proposed (Revelle and Suess, 1957) that non-linearities in the carbon dioxide buffering capacity of surface seawater should sustain positive feedbacks, with this chemical mechanism active even in the absence of perturbations to the physical state of the climate system. More recent research over the last two decades has tended to focus on dynamically-driven perturbations to the physical state of the ocean in defining climate feedbacks (Friedlingstein et al., 2006). However to date the relative importance of these two mechanisms has not been evaluated in a consistent modeling framework. Here we consider output from the CMIP5-generation of GFDL models to show that the ocean carbon-chemistry feedback of the type proposed by Revelle and Suess (1957) is at least an order of magnitude stronger than the ocean carbon-climate feedback of the type emphasized by Friedlingstein et al. (2006) under historical/RCP8.5 perturbation pathways to the climate system.

Keywords: Climate, Ocean, Carbon