A Workshop on Ocean-based CDR Opportunities and Challenges,
Part 4: Nutrient Fertilization & Artificial Upwelling and Downwelling
February 25, 2021
12pm – 4:30pm EST

Speaker Bios

Philip Boyd is a professor of marine biogeochemistry at the Institute for Marine and Antarctic Studies in Hobart, Australia. He has worked on better informing the debate on climate intervention approaches for over a decade. His interest in climate intervention came from two research voyages he led during which large-scale (100-1000 km2) patches of iron-fertilised ocean were created to better understand the role of the micronutrient iron in altering Earth's climate during the glacial maxima. He is currently the co-chair of the UN cross-agency GESAMP Working Group 41 on marine climate intervention and also a member of CIRCA (Centre for Innovation for Recovery of Climate Australia).

Francisco Chavez is a biological oceanographer interested in how climate variability and change regulate ocean ecosystems on local and basin scales. He was born and raised in Peru, has a BS from Humboldt State and a PhD from Duke University. He is a founding member of the Monterey Bay Aquarium Research Institute (MBARI) where he has pioneered time series research and the development of new instruments and systems to make this type of research sustainable. Chavez is a Fellow of the American Association for the Advancement of the Sciences; honored for distinguished research on the impact of climate variability on oceanic ecosystems and global carbon cycling. Chavez is also a Fellow of the American Geophysical Union; honored for advancing fundamental knowledge of the physical-biological coupling between Pacific Decadal Oscillations, productivity, and fisheries. He was awarded a Doctor Honoris Causa by the Universidad Pedro Ruiz Gallo in Peru in recognition of his distinguished scientific career and for contributing to elevate academic and cultural levels of university communities in particular and society in general. Chavez is the 2014 recipient of the Ed Ricketts Memorial award.

Stephanie Henson is a Principal Scientist at the National Oceanography Centre and Honorary Professor at the University of Southampton. She leads an active research group in global marine biogeochemistry, currently made up of 18 research staff and students. Her particular research interests aim at understanding natural variability and climate change effects on phytoplankton populations and subsequent impacts on the biological carbon pump. Her research exploits autonomous vehicles, satellite and in situ data, as well as output from biogeochemical models. In 2012, she received the EGU Award for Outstanding Young Scientist for her 'fundamental contribution to the study of marine ecosystems' and in 2016 she was awarded a prestigious European Research Council Consolidator Grant. She is a lead author on the Intergovernmental Panel on Climate Change's 6th Assessment Report, on the chapter "Carbon and other biogeochemical cycles and feedbacks".

Fei Chai has been a faculty member at the University of Maine since 1994, and he studies physical and biological processes contributing to global carbon cycle, ocean acidification, open ocean and coastal hypoxia, and climate variability affecting marine ecosystems and fisheries. Prof. Chai is an expert in developing and testing physical-biological models, and using models along with in situ and remote sensing observational data to address key regional and global questions and issues. Prof. Chai serves as

committee member for several international scientific organizations and programs, promoting interdisciplinary research and international collaboration.

Ricardo Letelier is a professor at Oregon State University's College of Earth, Ocean, and Atmospheric Sciences. Ricardo is interested in understanding how environmental perturbations shape the structure of pelagic microbial communities and their role on biogeochemical cycles. Ricardo's research is focused on microbial ecology/phytoplankton physiology and nitrogen fixation, spatial and temporal scales of variability in ecosystem structure, bio-optics, and ocean color remote sensing. Ricardo received his B.S. in Marine Biology from the Universidad de Concepción, Chile and his Ph.D. in Oceanography from the University of Hawaii.

David Koweek is the Science Director of Ocean Visions, where is responsible for the accuracy and integrity of the science underpinning Ocean Visions activities. In this role, he co-leads Ocean Visions efforts to support the development and testing ocean-based carbon dioxide removal approaches. David is trained as a chemical oceanographer and marine scientist. He has led and participated in field expeditions all across the world, including on the Great Barrier Reef, the Ross Sea, the California coast, the Sargasso Sea, and natural carbon dioxide vents off Italy. An expert in evaluating the geophysical potential of various ocean solutions, David is a frequent participant in research conferences and expert-level panels, including recent panels for the Energy Futures Initiative and the Foundation for Climate Restoration. His scholarly works have been published in top-tier journals, including Nature. Prior to his role with Ocean Visions, David was a postdoctoral research scientist at the Carnegie Institution for Science. He holds a Ph.D. from Stanford University and a B.S. from Brown University.

Ulf Riebesell is head of the research unit Biological Oceanography at GEOMAR Helmholtz Centre for Ocean Research Kiel and since 2003 Professor for Marine Biogeochemistry at the Christian Albrechts University Kiel. He studied biology and biological oceanography in Kiel, Seattle, and Rhode Island, completed a PhD at the University of Bremen and worked as postdoc at the University of California Santa Barbara. He is member of the Excellence Cluster, "The Future Ocean" and coordinator of the BMBF project: CUSCO – Coastal Upwelling in a Changing Ocean. In 2011 he was awarded the Vernadsky Medal of the European Geosciences Union, in 2012 the Leibniz Prize of the German Science Foundation and in 2016 an Advanced Grant of the European Research Council.

Kate Ricke is an assistant professor at the School and holds a joint appointment with the Scripps Institution of Oceanography. She is a climate change scientist who integrates tools from the physical and social sciences to analyze climate policy problems. Central to her work is accounting for uncertainty and heterogeneity—both in the effects of climate change and in preferences for how to address them.

Ricke recently served as a research associate in the Sibley School of Mechanical and Aerospace Engineering at the Cornell University and a fellow at the Carnegie Institution for Science. Her current research includes topics ranging from the regional climate effects and international relations implications of solar geo-engineering to decadal climate variability's influence on international climate agreements. She's assessed uncertainty in phenomena, including ocean acidification's effects on coral reefs and the warming effect from an emission of carbon dioxide today.

Raymond Schmitt is a Scientist Emeritus at the Woods Hole Oceanographic Institution and President & Founder of both Neal Brown Ocean Sensors, Inc. and Salient Predictions, Inc. He holds a B.S. degree in Physics from Carnegie-Mellon University and a Ph.D. in Physical Oceanography from the University of

Rhode Island. He is a leading expert on double-diffusive convection, ocean turbulence and the global water cycle. He has over 40 years of experience in oceanographic theory, observations and instrument development, with over 100 refereed publications and over 11,000 citations. He has two patents. He has served on several NRC panels including the Ocean Studies Board, the America's Climate Choices Panel, the Committee for Marine and Hydrokinetic Energy Technology Assessment and the Sustaining Ocean Observations Workshop Committee. He currently serves on the NASA Earth Sciences Advisory Committee. He is a fellow of the American Geophysical Union and was a J.S Guggenheim Fellow in 1997-1998. He recently worked with his sons to win $250,000 in a rainfall forecasting contest for the US West by combining new insights into the ocean's role in the water cycle with artificial intelligence techniques (https://www.whoi.edu/oceanus/feature/a-rainfall-forecast-worth-its-salt/).

Nicolas Gruber is full Professor of Environmental Physics at ETH Zurich, Switzerland. He is interested in the ocean and its interaction with climate, with a strong focus on the global cycling of carbon and other biogeochemically relevant elements, such as nitrogen and oxygen. He combines the analysis of observations with modeling studies to better quantify, for example, the fate of the anthropogenic CO_2 emissions in the Earth system, particularly the uptake by the ocean. He has written more than 180 peer-reviewed publication, with more than 25 of those having been published in the Nature and Science family of journals. For the last three years, he has been recognized as a highly cited author. He authored together with Jorge Sarmiento the textbook "Ocean Biogeochemical Dynamics" that has become a standard text in the field. In recognition of his outstanding contribution to Marine Sciences, Dr. Gruber received the Rosenstiel Award from the University of Miami in 2004. In 2012 he was elected fellow of the American Geophysical Union. He is chair of ETH's Center for Climate System Modeling, is member of several international research boards and serves as a review editor for Science Magazine and as an editor for AGU Advances. He is also member of the governing board of Climate-KIC, the largest European public-private partnership fostering innovation in the field of climate change.

Joellen Russell is the Thomas R. Brown Distinguished Chair of Integrated Science and Professor of Biogeochemical Dynamics at the University of Arizona. Joellen's research focuses on the ocean's role in climate. Her earlier work on the westerly winds led to her greatest research accomplishment so far: the creation of a new paradigm in climate science, namely that warmer climates produce stronger westerly winds. This insight solved one of the long-standing climate paradoxes, the mechanism responsible for transferring one-third of the carbon dioxide in the atmosphere into the ocean and then back out again during our repeated glacial-interglacial cycles.

Her recent work includes: patterns of drought in the continental US; the interactions and feedbacks between orogeny and orography and regional and global climate; and the circulation of the methane atmosphere on Saturn's moon Titan. Prof. Russell continues active collaboration with the GFDL Earth System Model and Climate Model Development Teams, and is currently serving as a member of the U.S. CLIVAR Office, Process Studies and Model Improvements Panel.

Chris Vivian is currently a co-chair of GESAMP Working Group 41 on 'Ocean Interventions for Climate Change Mitigation' (formerly the Working Group on Marine Geoengineering). He retired from Cefas, the Centre for Environment, Fisheries and Aquaculture Science (an agency of the UK Department for Environment, Food and Rural Affairs) in October 2016 where he had more than 30 years' experience in an advisory role to UK Government on issues relating to the environmental impacts of various human activities in the marine environment. He took part as a UK delegate in international meetings under the

Oslo (now OSPAR) and London Conventions dealing with waste disposal at sea in the North-East Atlantic and the whole world respectively. He was the Chairman of the Scientific Groups of the London Convention and London Protocol from 2008 to 2011 and was the Chairman of the OSPAR Convention's Biodiversity Committee that dealt with species/habitat protection issues as well as the impacts of human activities from 2006 to 2010. At the London Convention/Protocol meetings Chis was heavily involved in the discussions on ocean fertilization and marine geoengineering from 2007 and chaired the working group that finalized the amendments to the London Protocol on marine geoengineering in 2013. He received a BSc in Geology and Oceanography in 1971 and a PhD in Marine Geochemistry in 1975, both from the University College of Swansea in Wales.