The IPCC Special Report on the Ocean and Cryosphere in a Changing Climate was released in September 2019. The report documents observed physical and ecosystem changes and impacts on people and ecosystem services, focusing on changes over the last few decades.

The Summary for Policymakers (SPM) summarizes the main findings in relatively plain English. A link to the SPM is posted on the class web page and you can also find it on Canvas. Drawing on information in class lectures and your reading of the SPM from Working Groups I and II, give brief answers to the following questions – generally one paragraph per section. In your responses please incorporate a treatment of the confidence level of effects and predictions – “highly likely” etc.

(1) What are the principal observed and modeled physical changes in the cryosphere?
(2) How have these cryosphere changes impacted ecosystems?
(3) Summarize the principal observed and modeled physical changes in ocean heat content. How does the warming vary regionally and with depth as well as globally? How is it predicted to change in the future?
(4) How is ocean density stratification changing and what impact might that have on mixing? What are the projected changes?
(5) What are the factors affecting oxygen levels in the ocean?
(6) Summarize how physical changes in the oceans are impacting marine ecosystems. What do models project for changes in primary productivity, biomass, and fisheries?
(7) Describe the trends in Global Mean Sea Level (GMSL) rise and rank the dominant processes contributing to this.
(8) Describe some key characteristics of change in coastal oceans and coastal marine ecosystems and projections for the future.
(9) What are the effects (present and predicted) of the global increase in atmospheric CO$_2$ on the biology of the ocean? In your answer discuss: temperature, pH/ocean acidification, and the marine biological pump. Consider both the organic carbon and carbonate portions of the pump and explain your reasoning.
(10) Discuss the projected effects that changes in circulation may have on CO$_2$ uptake and ecosystems.
(11) What are Representative Concentration Pathways (RCPs)? Give a brief synopsis of the RCP2.6 and RCP8.5 that the SPM focuses on.