Table S.1 – State of knowledge on potential candidate processes that might undergo abrupt change. These include both abrupt climate changes in the physical climate system and abrupt climate impacts of ongoing changes that, when certain thresholds are crossed, can cause abrupt impacts for society and ecosystems. The near term outlook for this century is highlighted as being of particular relevance for decision makers generally.

	Potential Abrupt Climate Change or Impact and Key Examples of Consequences	Current Trend	Near Term Outlook (for an Abrupt Change within This Century)	Long Term Outlook (for a Significant Change[1] after 2100)	Level of Scientific Understanding	Critical Needs (Research, Monitoring, etc.)
Abrupt Changes in the Ocean	**Disruption to Atlantic Meridional Overturning Circulation (AMOC)** • Up to 80 cm sea level rise in North Atlantic • Southward shift of tropical rain belts • Large disruptions to local marine ecosystems • Ocean and atmospheric temperature and circulation changes • Changes in ocean's ability to store heat and carbon	Trend not clearly detected	**Low**	High	Moderate	• Enhanced understanding of changes at high latitudes in the North Atlantic (e.g., warming and/or freshening of surface waters) • Monitoring of overturning at other latitudes • Enhanced understanding of drivers of AMOC variability
	Sea level rise (SLR) from ocean thermal expansion • Coastal inundation • Storm surges more likely to cause severe impacts	Moderate increase in sea level rise	**Low**[2]	High	High	• Maintenance and expansion of monitoring of sea level (tide gauges and satellite data), ocean temperature at depth, local coastal motions, and dynamic effects on sea level
	Sea level rise from destabilization of WAIS ice sheets • 3-4 m of potential sea level rise • Coastal inundation • Storm surges more likely to cause severe impacts	Losing ice to raise sea level	**Unknown but Probably Low**	Unknown	Low	• Extensive needs, including broad field, remote-sensing, and modeling research
	Sea level rise from other ice sheets (including Greenland and all others, but not including WAIS loss) • As much as 60m of potential sea level rise from all ice sheets • Coastal inundation • Storm surges more likely to cause severe impacts	Losing ice to raise sea level	**Low**	High	High for some aspects, low for others	• Maintenance and expansion of satellite, airborne, and surface monitoring capacity, process studies, and modeling research

Table S.1 – State of knowledge on potential candidate processes that might undergo abrupt change. (*continued*)

	Potential Abrupt Climate Change or Impact and Key Examples of Consequences	Current Trend	Near Term Outlook (for an Abrupt Change within This Century)	Long Term Outlook (for a Significant Change[1] after 2100)	Level of Scientific Understanding	Critical Needs (Research, Monitoring, etc.)
...in the Ocean (cont.)	**Decrease in ocean oxygen (expansion in oxygen minimum zones (OMZs))** • Threats to aerobic marine life • Release of nitrous oxide gas—a potent greenhouse gas—to the atmosphere	Trend not clearly detected	**Moderate**	High	Low to Moderate	• Expanded and standardized monitoring of ocean oxygen content, pH, and temperature • Improved understanding and modeling of ocean mixing • Improved understanding of microbial processes in OMZs
Abrupt Changes in the Atmosphere	**Changes to patterns of climate variability (e.g., ENSO, annular modes)** • Substantial surface weather changes throughout much of extratropics if the extratropical jetstreams were to shift abruptly	Trends not detectable for most patterns of climate variability Exception is southern annular mode—detectable poleward shift of middle latitude jetstream	**Low**	Moderate	Low to Moderate	• Maintaining continuous records of atmospheric pressure and temperatures from both in-situ and remotely sensed sources • Assessing robustness of circulation shifts in individual ensemble members in climate change simulations • Developing theory on circulation response to anthropogenic forcing
	Increase in intensity, frequency, and duration of heat waves • Increased mortality • Decreased labor capacity • Threats to food and water security	Detectable trends in increasing intensity, frequency, and duration of heat waves	**Moderate** (Regionally variable, dependent on soil moisture)	High	High	• Continued progress on understanding climate dynamics • Increased focus on risk assessment and resilience
	Increase in frequency and intensity of extreme precipitation events (droughts/floods/ hurricanes/major storms) • Mortality risks • Infrastructure damage • Threats to food and water security • Potential for increased conflict	Increasing trends for floods Trends for drought and hurricanes not clear	**Moderate**	Moderate / High	Low to Moderate	• Continued progress on understanding climate dynamics • Increased focus on risk assessment and resilience

Table S.1 – State of knowledge on potential candidate processes that might undergo abrupt change. (*continued*)

	Potential Abrupt Climate Change or Impact and Key Examples of Consequences	Current Trend	Near Term Outlook (for an Abrupt Change within This Century)	Long Term Outlook (for a Significant Change[1] after 2100)	Level of Scientific Understanding	Critical Needs (Research, Monitoring, etc.)
Abrupt Changes at High Latitudes	**Increasing release of carbon stored in soils and permafrost** • Amplification of human-induced climate change[3]	Neutral trend to small trend in increasing soil carbon release	**Low**	High	Moderate[4]	• Improved models of hydrology/cryosphere interaction and ecosystem response • Greater study of role of fires in rapid carbon release • Expanded borehole temperature monitoring networks • Enhanced satellite and ground-based monitoring of atmospheric methane concentrations at high latitudes
	Increasing release of methane from ocean methane hydrates • Amplification of human-induced climate change	Trend not clearly detected	**Low**[5]	Moderate	Moderate[6]	• Field and model based characterization of the sediment column • Enhanced satellite and ground-based monitoring of atmospheric methane concentrations at high latitudes
	Late-summer Arctic sea ice disappearance • Large and irreversible effects on various components of the Arctic ecosystem • Impacts on human society and economic development in coastal polar regions • Implications for Arctic shipping and resource extraction • Potential to alter large-scale atmospheric circulation and its variability	Strong trend in decreasing sea ice cover	**High**	Very high	High	• Enhanced Arctic observations, including atmosphere, sea ice and ocean characteristics • Better monitoring and census studies of marine ecosystems • Improved large-scale models that incorporate the evolving state of knowledge
	Winter Arctic sea ice disappearance • Same as late summer Arctic sea ice disappearance above, but more pronounced due to year-round lack of sea ice	Small trend (Decreasing but not disappearing)	**Low**	Moderate	High	• Same as late summer Arctic sea ice disappearance above

Table S.1 – State of knowledge on potential candidate processes that might undergo abrupt change. (*continued*)

	Potential Abrupt Climate Change or Impact and Key Examples of Consequences	Current Trend	Near Term Outlook (for an Abrupt Change within This Century)	Long Term Outlook (for a Significant Change[1] after 2100)	Level of Scientific Understanding	Critical Needs (Research, Monitoring, etc.)
Abrupt Changes in Ecosystems	**Rapid state changes in ecosystems, species range shifts, and species boundary changes** • Extensive habitat loss • Loss of ecosystem services • Threats to food and water supplies	Species range shifts significant; others not clearly detected	**Moderate**	High	Moderate	• Long term remote sensing and in situ studies of key systems • Improved hydrological and ecological models
	Increases in extinctions of marine and terrestrial species • Loss of high percentage of coral reef ecosystems (already underway) • Significant percentage of land mammal, bird, and amphibian species extinct or endangered[7]	Species and population losses accelerating (Portion attributable to climate is uncertain)	**High**	Very high	Moderate	• Better understanding of how species interactions and ecological cascades might magnify extinctions intensity • Better understanding of how interactions between climate-caused extinctions and other extinction drivers (habitat fragmentation, overexploitation, etc.) multiply extinction intensity • Improved monitoring of key species

[1] Change could be either abrupt or non-abrupt

[2] To clarify, the Committee assesses the near-term outlook that sea level will rise abruptly before the end of this century as Low; this is not in contradiction to the assessment that sea level will continue to rise steadily with estimates of between 0.26 and 0.82m by the end of this century (IPCC, 2013).

[3] Methane is a powerful but short-lived greenhouse gas

[4] Limited by ability to predict methane production from thawing organic carbon

[5] No mechanism proposed would lead to abrupt release of substantial amounts of methane from ocean methane hydrates this century

[6] Limited by uncertainty in hydrate abundance in near-surface sediments, and fate of CH_4 once released

[7] Species distribution models (Thuiller et al., 2006) indicate between 10–40% of mammals now found in African protected areas will be extinct or critically endangered by 2080 as a result of modeled climate change. Analyses by Foden et al.(2013) and Ricke et al. (Ricke et al., 2013) suggest 41% of bird species, 66% of amphibian species, and between 61% and 100% of corals that are not now considered threatened with extinction will become threatened due to climate change sometime between now and 2100.

From *Abrupt Impacts of Climate Change: Anticipating Surprises* (The National Research Council, 2013).