Climate Variable and Trend	Observed Change	Trend	Relative Change	Future Projections	Confidence	Uncertainty	Source(s)
Air temperature	**Samoa** From 1950-2009: > Average annual temperatures increased +0.25°F (+0.14°C) per decade > Average maximum air temperatures increased +0.4°F (+0.22°C) per decade > Average minimum air temperatures increased +0.07°F (+0.04°C) per decade	↑	High	**Central South Pacific** Annual surface air temperature (compared to 1971-2000) > By 2030: +1.1-1.3°F (+0.61-0.72°C) > By 2050: +1.9-2.5°F (+1.06-1.39°C) > By 2090: +2.5-4.8°F (+1.39-2.67°C) **Pacific Islands** > Extreme heat days will become more frequent and intense during the 21st century	> High confidence in trend direction > Medium confidence in trend magnitude	> Magnitude of change varies by greenhouse gas emission scenario: B1 (lower) and A2 (higher)	Australian Bureau of Meteorology and CSIRO 2011; Finucane et al. 2011; Young 2007
Sea surface temperature	**Pacific Islands** > Sea surface temperatures have increased regionally at a rate of 0.13-0.41°F (+0.07-0.23°C) per decade since 1970 **American Samoa and Samoa** > It is difficult to determine long-term trends due to regional variability > American Samoa has exhibited warming trends (exact rates aren't available) > Samoa experienced sea surface warming at a rate of +0.14°F (+0.08°C) per decade from 1970-2011	↑	High	**Pacific Islands** Sea surface temperatures (compared to 1990, ranges represent low [B1] and high [A2] emissions scenarios) 1 > By 2030: +1.1-1.7°F (+0.61-0.94°C) > By 2055: +1.8-2.3°F (+1-1.28°C) > By 2090: +2.5-4.7°F (+1.39-2.61°C)	> High confidence in trend direction > Medium confidence in trend magnitude	> Magnitude varies by emissions scenario: B1 (lower) and A2 (higher) > Shifts in sea surface temperature will also be affected by ENSO, the PDO, and the IPO	Australian Bureau of Meteorology and CSIRO 2011; Finucane et al. 2011; Marra et al. 2012; Office of National Marine Sanctuaries 2012
Extreme Precipitation Events	**Central South Pacific** > No significant trend in the frequency of extreme rainfall events since 1965	↑	Moderate	**Central South Pacific** > Extreme rainfall events will be correlated with tropical storm activity (see below), but are likely to increase in frequency and intensity during the 21st century	> Moderate confidence in trend direction > Low confidence in trend magnitude	> Extreme rainfall projections are highly variable based on land form, ENSO/PDO patterns, and other factors. > There is very little long-term extreme precipitation data for American Samoa to derive trends and inform projections.	Australian Bureau of Meteorology and CSIRO 2011; Keener et al. 2012; Young 2007

Climate Variable and Trend	Observed Change	Trend	Relative Change	Future Projections	Confidence	Uncertainty	Source(s)
Precipitation and drought	**American Samoa** > No significant trends in annual precipitation or winter one-day precipitation volume since 1965 > No change in drought event frequency in 60 years **Samoa** > No significant trends in seasonal or annual rainfall from 1950-2009 or from 1890-2005 > No change in drought frequency from 1942-2005, but events are correlated with El Nino conditions	↑↓	Low	**Central South Pacific** > Projections are highly variable and display conflicting results > Future conditions may include no change or a slight increase in mean annual precipitation with slight decreases during the dry season and slight increases during the wet season during the 21st century **Samoa** > Drought frequency isn't likely to exhibit major change during the 21st century	> Low confidence in trend direction and magnitude	> Precipitation projections for the Pacific Region are highly variable depending on emissions scenario and are influenced by many factors (e.g., ENSO/PDO/IPO phases, island location and geography). > There is very little long-term annual precipitation data for American Samoa to derive trends and inform projections.	Australian Bureau of Meteorology and CSIRO 2011; Cheng and Gaskin 2011; Keener et al. 2012; Young 2007
Tropical storms	**Central South Pacific** > The number of tropical storms escalating to cyclones increased in 1991-2010 relative to 1970-1990.	↑	Low	**American Samoa and Samoa** **>** Potential reduction in cyclone activity as storm tracks shift toward the Central North Pacific **Pacific Islands** **>** Increased storm intensity over the next 70 years	> Low confidence in trend direction and magnitude	> Tropical storm tracks will be influenced by regional variability related to ENSO, the PDO, and the IPO > The region exhibits high inter-annual variability in storm activity	Australian Bureau of Meteorology and CSIRO 2011; Emanuel 2005; Li et al. 2010; Seneviratne et al. 2012; Yu et al. 2010
Streamflow	**American Samoa** > No trend in total streamflow, baseflow, or the number of extreme low- or high-flow days from 1960-1995	No trend	Low	**American Samoa** **>** No specific projections, but streamflow will likely fluctuate with precipitation patterns	> Low confidence in trend direction and magnitude	> There is very little long-term data for American Samoa to derive trends and inform projections. > Many streams in American Samoa experience human modifications to streamflow.	Keener et al. 2012

Climate Variable and Trend	Observed Change	Trend	Relative Change	Future Projections	Confidence	Uncertainty	Source(s)
Sea level rise	**Global** > Global sea levels increased 3.4 mm (+/- 0.4 mm) per year from 1993-2009, representing a much faster rate of rise than the 20th century **Western Tropical Pacific** > Relative rates of sea level rise matched or exceeded global rates from 1993-2010 due to enhanced trade wind conditions **American Samoa** > Mean sea level increased 2.07 mm/year at Pago Pago from 1948-2006	↑	High	**Pacific Islands** Region will experience roughly same mean average sea level rise as global trends. > By 2100: - "Low" scenario: 0.2 m - "Intermediate-Low" scenario: 0.5 m - "Intermediate-High" scenario: 1.2 m - "High" scenario: 2.0 m > Increased frequency of extreme sea level events (linked with high tide events)	> High confidence in trend direction > Low confidence in trend magnitude	> Magnitude projections vary based on model used (climate model vs. semi-empirical model) and emissions scenario. Additionally, sea level rise could accelerate if ice-sheet discharge increases, which is likely given current trends. > Regional variations in sea level rise likely due to land dynamics (subsidence/uplift) and changes in ocean circulation (ENSO/PDO) and wind patterns.	Cheng and Gaskin 2011; Marra et al. 2012; Nerem et al. 2010
Wave height	**Pacific Islands** > No trend in wave heights available	↑	Low	**Pacific Islands** > Increased annual mean wave height in the southern tropical Pacific, decreased wave heights in most other Pacific areas		Few long-term records exist	Hemer et al. 2013; Marra et al. 2012; Seneviratne et al. 2012; Young et al. 2011
Ocean acidification	**Samoa** > Aragonite saturation state declined from 4.5 to 4.1 between the 18th century and 2000	↑	High	**Samoa** > By 2060: aragonite saturation state will fall below 3.5, and continue declining thereafter	> High confidence in trend direction > Moderate confidence in trend magnitude	> Carbon cycles are difficult to model, and regional biases and downscaling challenges exist in current models	Australian Bureau of Meteorology and CSIRO 2011

Literature Cited

1. Australian Bureau of Meteorology and CSIRO. 2011. Climate change in the Pacific: scientific assessment and new research. Volume 1: regional overview. Volume 2: county reports. Available from http://www.pacificclimatechangescience.org/publications/reports/report-climate-change-in-the-pacific-scientific-assessment-and-new-research/.
2. Cheng B, Gaskin E. 2011. Climate impacts to the nearshore marine environment and coastal communities: American Samoa and Fagatele Bay National Marine Sanctuary. Marine Sanctuaries Conservation Series ONMS-11-05. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries, Silver Spring, MD. Available from http://sanctuaries.noaa.gov/science/conservation/pdfs/fbnms_climate.pdf.
3. Emanuel K. 2005. Increasing destructiveness of tropical cyclones over the past 30 years. Nature 436:686–688.
4. Finucane ML, Marra JJ, Keener VW, Smith MH. 2012. Chapter 1: Pacific Islands region overview. Pages 1-34 in V. W. Keener, J. J. Marra, M. L. Finucane, D. Spooner, and M. H. Smith, editors. Climate change and Pacific Islands: indicators and impacts. Report for the 2012 Pacific Islands Regional Climate Assessment. Island Press, Washington, D.C. Available from http://www.cakex.org/sites/default/files/documents/NCA-PIRCA-FINAL-int-print-1.13-web.form_.pdf.
5. Hemer MA, Fan Y, Mori N, Semedo A, Wang XL. 2013. Projected changes in wave climate from a multi-model ensemble. Nature Climate Change 3:471–476.
6. Keener VW, Izuka SK, Anthony S. 2012. Chapter 2: freshwater and drought on Pacific Islands. Pages 35-64 in V. W. Keener, J. J. Marra, M. L. Finucane, D. Spooner, and M. H. Smith, editors. Climate change and Pacific Islands: indicators and impacts. Report for the 2012 Pacific Islands Regional Climate Assessment. Island Press, Washington, D.C. Available from http://www.cakex.org/sites/default/files/documents/NCA-PIRCA-FINAL-int-print-1.13-web.form_.pdf.
7. Li T, Kwon M, Zhao M, Kug J-S, Luo J-J, Yu W. 2010. Global warming shifts Pacific tropical cyclone location. Geophysical Research Letters 37:L21804.
8. Marra JJ, Merrifield MA, Sweet WV. 2012. Chapter 3: sea level and coastal inundation on Pacific Islands. Pages 65-88 in V. W. Keener, J. J. Marra, M. L. Finucane, D. Spooner, and M. H. Smith, editors. Climate change and Pacific Islands: indicators and impacts. Report for the 2012 Pacific Islands Regional Climate Assessment. Island Press, Washington, D.C. Available from http://www.cakex.org/sites/default/files/documents/NCA-PIRCA-FINAL-int-print-1.13-web.form_.pdf.
9. Nerem RS, Chambers DP, Choe C, Mitchum GT. 2010. Estimating mean sea level change from the TOPEX and Jason Altimeter Missions. Marine Geodesy 33:435–446.
10. Seneviratne SI et al. 2012. Changes in climate extremes and their impacts on the natural physical environment. Pages 109–230 in C. B. Field et al., editors. Managing the risks of extreme events and disasters to advance climate change adaptation. A special report of Working Groups I and II of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, UK and New York, NY. Available from http://www.ipcc-wg2.gov/SREX/images/uploads/SREX-All_FINAL.pdf.
11. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Office of National Marine Sanctuaries. 2012. Fagatele Bay National Marine Sanctuary final management plan/final environmental impact statement. Silver Spring, MD. Available from http://sanctuaries.noaa.gov/management/mpr/mpr-nmsam-2012.pdf.
12. Young IR, Zieger S, Babanin AV. 2011. Global trends in wind speed and wave height. Science 332:451–455.
13. Young WJ. 2007. Climate risk profile for Samoa. Samoa Meteorology Division. Available from http://www.adaptation-undp.org/sites/default/files/downloads/climate_risk_profile_for_samoa.pdf.
14. Yu J, Wang Y, Hamilton K. 2010. Response of tropical cyclone potential Intensity to a global warming scenario in the IPCC AR4 CGCMs. Journal of Climate 23:1354–1373.