

RCCC Global changes in climate extremes

Based on Working Group I SPM Table SPM.1: Summary of the likely range of climate change in the past, human contribution to these changes, and projected further changes for the early (2016-2035) and late (2081-2100) 21st century. Projections in the AR5 are relative to the reference period of 1986–2005, and use the new RCP scenarios.

Phenomenon and direction of trend	Have these changes already occurred (since 1950)?	Have humans contributed to these changes?	Likelihood of further changes		Summary message
			Early 21st century	Late 21st century	
Warmer and/or more frequent hot days/nights and/or fewer cold days and nights over most land areas	<i>Very likely</i>	<i>Very likely</i>	<i>Likely</i>	<i>Virtually certain</i>	More certainty that the climate has warmed in the past and will warm in the future.
More frequent and/or longer warm spells and heatwaves over most land areas	<i>Medium confidence</i> on a global scale. <i>Likely</i> in large parts of Europe, Asia and Australia	<i>Likely</i>	Not formally assessed	<i>Very likely</i>	More warm spells/heat waves in the future.
Increases in intense tropical cyclone activity	<i>Low confidence</i> in long term (centennial) changes <i>Virtually certain</i> in North Atlantic since 1970	<i>Low confidence</i>	<i>Low confidence</i>	<i>More likely than not</i> in some basins	<i>Low confidence</i> on tropical cyclone intensity increases in past and future.
Increased incidence and/or magnitude of extreme high sea level	<i>Likely</i> (since 1970)	<i>Likely</i>	<i>Likely</i>	<i>Very likely</i>	Extreme high sea levels increasing in the future.
Heavy precipitation events. Increase in the frequency, intensity, and/or amount of heavy precipitation.	<i>Likely</i> more land areas with increases than decreases <i>Very likely</i> in central North America	<i>Medium confidence</i>	<i>Likely</i> over many land areas	<i>Very likely</i> over most of the mid-latitude land-masses and over wet tropical regions	More intense and frequent heavy rains over most of the mid-latitude and wet tropical regions.
Increases in intensity and/or duration of drought	<i>Low confidence</i> on a global scale. <i>Likely</i> increased in the Mediterranean and West Africa and <i>likely</i> decreased in central North America and north-west Australia	<i>Low confidence</i>	<i>Low confidence</i> (in projected changes in soil moisture)	<i>Likely (medium confidence)</i> on a regional to global scale	<i>Low confidence</i> on droughts in past and future.

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<p>Rainfall patterns</p>	<p>Precipitation (rain and snow) has varied throughout the world in the last 100 years. No clear long-term trends have been observed in global average precipitation because of data insufficiency. Regionally, precipitation has increased in the mid-latitude land areas of the northern hemisphere since 1901 (<i>medium confidence</i> prior to 1950 and <i>high confidence</i> afterwards).</p>	<p>It is <i>likely</i> that anthropogenic influences have affected the global water cycle and precipitation patterns since 1960.</p>	<p>Projections for rainfall for the next few decades show large-scale changes similar to the changes that are expected by the end of the century (box to the right), but will also be influenced by natural variability (ups and downs) in the next few decades.</p> <p>In addition, the contrast in precipitation between wet and dry regions and between wet and dry seasons will increase, although there may be regional exceptions.</p>	<p>Many places will see changes to rain or snow, and also changes to heavy rainfall or drought. It is not clear exactly how each region will change in the future, but some patterns are projected.</p> <p>By the end of the century, more rain/snow on average is <i>likely</i> in mid-latitude wet regions, in the high latitudes, and the equatorial Pacific Ocean. Less rain is <i>likely</i> in many mid-latitude dry regions.</p> <p>Most land areas in mid-latitudes and wet tropical regions are <i>very likely</i> to see more intense and frequent extreme rainfall events.</p>	<p>Rainfall patterns are changing, but the changes are more spatially varied than for temperature, and depending on the region, there are higher uncertainties and many ups and downs are expected.</p>	
				<p>2046 - 2065</p>	<p>2081 - 2100</p>	
<p>Global Average Surface Temperature Change (°C)</p>	<p>We have observed a warming of the planet over time. In the northern hemisphere, the period 1983–2012 was <i>likely</i> the warmest 30-year period of the last 1400 years (<i>medium confidence</i>).</p>	<p>It is <i>extremely likely</i> that human influence has been the dominant cause of the observed warming since the mid-20th century.</p>	<p>1 – 2</p>	<p>1 – 3.7</p>	<p>Past and future warming due to human influence.</p>	
<p>Global Average Sea Level Rise (m)</p>	<p>Global average sea level has risen in the last 100 years, and the rate of rise is unusually high compared to how the ocean has behaved in the last two million years. The rate of sea level rise since the mid-19th century has been larger than the mean rate during the previous two millennia (<i>high confidence</i>).</p>	<p>There is <i>high confidence</i> that human influence on climate raised global average sea level in the second half of the 20th century.</p>	<p>0.24 – 0.30</p>	<p>0.40 – 0.63</p>	<p>Past and future sea level rise due to human influence.</p>	