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- IPCC-AR5
- Temperature change
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- Improved monitoring capabilities
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IPCC-AR5

- **Sep 2013**: WG1 report
  (Physical Science Basis)

- **Mar 2014**: WG2 report
  (Impacts, Adaptation and Vulnerability)

- **Apr 2014**: WG3 rapport
  (Mitigation of Climate Change)

- **Oct 2014**: Synthesis rapport
IPCC-AR5

- **Sep 2013**: WG1 report
  (Physical Science Basis)
  Authors started Nov 2010
  Cut-off date papers Mar 2013
- **Mar 2014**: WG2 report
  (Impacts, Adaptation and Vulnerability)
- **Apr 2014**: WG3 rapport
  (Mitigation of Climate Change)
- **Oct 2014**: Synthesis rapport

Full WG1 report available:
[www.climatechange2013.org](http://www.climatechange2013.org)

observations > understanding > future
Final approval plenary, Stockholm, Sep 2013
Global temperature

HadCRUT4, GISS, MLOST

“Each of the last three decades has been successively warmer at the Earth’s surface than any preceding decade since 1850”

“It is extremely likely that human influence has been the dominant cause of the observed warming since the mid-20th century”
Global temperature

Figure SPM.1

Observed globally averaged combined land and ocean surface temperature anomaly 1850–2012

- Total warming since 1880: +0.85°C
- For 2 degrees target: +0.61°C
“Warming hiatus”

Flat trends over short time intervals are sensitive for start and end year

AR4 datasets more different
Temperature

Land surface air temperature

Sea surface temperature

Figures 2.14 en 2.18
Temperature

Warming over almost entire globe

Not all data series since 1901 are complete

Figure SPM.1, 2.22
Pattern of recent warming is different from that in the earlier warming period
“How do we know the world has warmed?”

Multiple lines of evidence

“Warming of the climate system is unequivocal”
Precipitation

Figure SPM.2

Incomplete datasets hamper truly global assessment

Most robust: increase over mid-latitude land areas since 1951
Precipitation

Figure SPM.2

Note reversal of precipitation trend over the Sahel in recent years
Extremes

Indicator for heavy precipitation events

(b) R95p 1951-2010

IPCC mainly considers moderate extremes

“It is likely that since about 1950 the number of heavy precipitation events over land has increased in more regions than it has decreased”
### Extremes

Table SPM.1

<table>
<thead>
<tr>
<th>Phenomenon and direction of trend</th>
<th>Assessment that changes occurred (typically since 1950 unless otherwise indicated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warmer and/or fewer cold days and nights over most land areas</td>
<td>Heavy precipitation events. Increase in the frequency, intensity, and/or amount of heavy precipitation</td>
</tr>
<tr>
<td>Warmer and/or more frequent hot days and nights over most land areas</td>
<td>Likely more land areas with increases than decreases</td>
</tr>
<tr>
<td>Warm spells/heat waves. Frequency and/or duration increases over most land areas</td>
<td>Likely more land areas with increases than decreases</td>
</tr>
<tr>
<td>Warm spells/heat waves. Frequency and/or duration increases over most land areas</td>
<td>Likely over most land areas</td>
</tr>
<tr>
<td>Increases in intensity and/or duration of drought</td>
<td>Low confidence on a global scale</td>
</tr>
<tr>
<td>Increases in intense tropical cyclone activity</td>
<td>Likely changes in some regions</td>
</tr>
<tr>
<td>Increased incidence and/or magnitude of extreme high sea level</td>
<td>Medium confidence in some regions</td>
</tr>
<tr>
<td>Increased incidence and/or magnitude of extreme high sea level</td>
<td>Likely in many regions, since 1970</td>
</tr>
</tbody>
</table>

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Note: Assessments are based on observational data and climate model projections. Assessments are subject to uncertainty and are updated as new evidence becomes available.
Use of satellite info

SeaWiFS data
(Hsu et al., 2012)

Figure 2.9
Use of satellite info

1979-2012
MSU products

AR4 discrepancy between radiosonde and satellite reduced considerably
CMIP5 projections

Figure 12.12
Take home

1) three datasets developed independently (HadCRUT4, MLOST, GISS) show consistent temperature rise since 1880

2) discussion about quality of observational series largely disappeared

3) multiple lines of evidence for a warming world

4) increase in mid latitudes since 1951 is most robust signal of precipitation change

5) IPCC is prudent about observed changes in extremes

6) satellite information increasingly used for assessment of change

7) discrepancy between upper-air warming observed by radiosondes and satellites reduced