

Appendix A. Glossary and Acronyms

Glossary

Ablation

Loss of snow and ice, primarily by melting and calving.

Abrupt Climate Change

A large-scale change in the climate system that takes place over a few decades or less, persists (or is anticipated to persist) for at least a few decades, and causes substantial disruptions in human and natural systems.

Albedo

The fraction of solar radiation reflected by a surface or object, often expressed as a percentage.

Anthropogenic

Resulting from or produced by human beings.

Atlantic meridional overturning circulation (AMOC)

A northward flow of warm, salty water in the upper layers of the Atlantic, and a southward flow of colder water in the deep Atlantic.

Clathrate

A substance in which a chemical lattice or cage of one type of molecule traps another type of molecule.

Climate system

The climate system is the highly complex system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the land surface and the biosphere, and the interactions between them. The climate system evolves in time under the influence of its own internal dynamics and because of external forcings such as volcanic eruptions, solar variations and anthropogenic forcings such as the changing composition of the atmosphere and land use change.

Climate feedback

An interaction mechanism between processes in the climate system is called a climate feedback when the result of an initial process triggers changes in a second process that in turn influences the initial one. A positive feedback intensifies the original process, and a negative feedback reduces it.

Climate model

A numerical representation of the climate system based on the physical, chemical and biological properties of its components, their interactions and feedback processes, and accounting for all or some of its known properties.

Climate variability

Climate variability refers to variations in the mean state and other statistics (such as standard deviations, the occurrence of extremes, etc.) of the climate on all spatial and temporal scales beyond that of individual weather events. Variability may be due to natural internal processes within the climate system (internal variability), or to variations in natural or anthropogenic external forcing (external variability).

Cryosphere

The component of the climate system consisting of all snow, ice and frozen ground (including permafrost) on and beneath the surface of the Earth and ocean.

Downscaling

A method that derives local- to regional-scale (10 to 100 km) information from larger scale models or data analyses.

El Niño Southern Oscillation (ENSO)

The term El Niño was initially used to describe a warm-water current that periodically flows along the coast of Ecuador and Perú, disrupting the local fishery. It has since become identified with a basin-wide warming of the tropical Pacific Ocean east of the dateline. This oceanic event is associated with a fluctuation of a global-scale tropical and subtropical surface pressure pattern called the Southern Oscillation. This coupled atmosphere-ocean phenomenon, with preferred time scales of two to about seven years, is collectively known as the El Niño-Southern Oscillation (ENSO). It is often measured by the surface pressure anomaly difference between Darwin and Tahiti and the sea surface temperatures in the central and eastern equatorial Pacific. During an ENSO event, the prevailing trade winds weaken, reducing upwelling and altering ocean currents such that the sea surface temperatures warm, further weakening the trade winds. This event has a great impact on the wind, sea surface temperature and precipitation patterns in the tropical Pacific. It has climatic effects throughout the Pacific region and in many other parts of the world, through global teleconnections. The cold phase of ENSO is called La Niña.

Forcing

Any mechanism that causes the climate system to change or respond.

Greenhouse gases (GHG)

Greenhouse gases are those gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and emit radiation at specific wavelengths within the spectrum of thermal infrared radiation emitted by the Earth's surface, the atmosphere itself, and by clouds. This property causes the greenhouse effect. Water vapor (H₂O), carbon dioxide (CO₂), nitrous oxide (N₂O), methane (CH₄) and ozone (O₃) are the primary greenhouse gases in the Earth's atmosphere. Moreover, there are a number of entirely human-made greenhouse gases in the atmosphere, such as the halocarbons and other chlorine- and bromine-containing substances, dealt with under the Montreal Protocol. Beside CO₂, N₂O and CH₄, the Kyoto Protocol deals with the greenhouse gases sulphur hexafluoride (SF₆), hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs).

Holocene Epoch

The geological epoch extending back approximately 11,500 years from the present.

Ice sheet

Glaciers of near-continental extent and of which there are at present two, the Antarctic Ice Sheet and the Greenland Ice Sheet.

La Niña

The cold phase of the El Niño Southern Oscillation (ENSO).

Mass Balance

The net glacier and ice-sheet annual gain or loss of ice/snow.

Medieval Warm Period

An interval between AD 900 and 1300 in which some Northern Hemisphere regions were warmer than during the Little Ice Age that followed.

Megadrought

Prolonged (multi-decadal) droughts such as those documented for the Medieval Period.

Methane

Methane (CH₄) is the second most important greenhouse gas that humans directly influence, carbon dioxide (CO₂) being first.

Methane hydrate

A solid in which methane molecules are trapped in a lattice of water molecules. On Earth, methane hydrate forms under high pressure – low temperature conditions in the presence of sufficient methane.

Paleoclimate

Climate during periods prior to the development of measuring instruments, including historic and geologic time, for which only proxy climate records are available.

Permafrost

Ground (soil or rock and included ice and organic material) that remains at or below 0°C for at least two consecutive years.

Proxy

A local record (e.g., pollen, tree rings) that is interpreted, using physical and biophysical principles, to represent some combination of climate-related variations back in time. Climate-related data derived in this way are referred to as proxy data. Examples of proxies include pollen analysis, tree ring records, characteristics of corals and various data derived from ice cores.

Radiative forcing

A change in the net radiation at the top of the troposphere caused by a change in the solar radiation, the infrared radiation, or other changes that affect the radiation energy absorbed by the surface (e.g., changes in surface reflection properties), resulting in a radiation

imbalance. A positive radiative forcing tends to warm the surface on average, whereas a negative radiative forcing tends to cool it. Changes in GHG concentrations represent a radiative forcing through their absorption and emission of infrared radiation.

Sea level change

Sea level can change, both globally and locally, due to (i) changes in the shape of the ocean basins, (ii) changes in the total mass of water and (iii) changes in water density.

Sea surface temperature (SST)

The temperature in the top few meters of the ocean, measured by ships, buoys and drifters.

Sink

Any process, activity or mechanism that removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas or aerosol from the atmosphere.

Thermohaline circulation (THC)

Currents driven by fluxes of heat and fresh water across the sea surface and subsequent interior mixing of heat and salt. The terms Atlantic Meridional Overturning Circulation (AMOC) and Thermohaline Circulation are often used interchangeably but have distinctly different meanings. The AMOC, by itself, does not include any information on what drives the circulation (See AMOC definition above). In contrast, THC implies a specific driving mechanism related to creation and destruction of buoyancy.

Tropopause

That area of the atmosphere between the troposphere and the stratosphere.

Acronyms

ABW, AABW	Antarctic Bottom Water
ACC	Antarctic Circumpolar Current
AGCM	Atmospheric General Circulation Model
ALT	active layer thickness
AMO	Atlantic Multidecadal Oscillation
AMOC	Atlantic Meridional Overturning Circulation
AOGCM	Atmosphere-Ocean General Circulation Model
AOVGCM	Atmosphere-Ocean-Vegetation General Circulation Model
AR4	Fourth Assessment Report, IPCC
ATM	Airborne laser altimetry
AVGCM	Atmosphere-Vegetation General Circulation Model
BSR	bottom-simulating reflector
CCD	carbonate compensation depth
CCSM	Community Climate System Model
CCSP	Climate Change Science Program
CLIVAR	Climate Variability and Predictability
COGA	Climatological Ocean Global Atmosphere
COHMAP	Cooperative Holocene Mapping Project
CZCS	Coastal Zone Color Scanner

D/H	Isotopic ratio of deuterium to hydrogen
D-O	Dansgaard-Oeschger
DWF	deep water formation
EDGAR	Emission Database for Global Atmospheric Research
EDMN	EPICA Droning Maud Land
EGVM	Equilibrium Global Vegetation Model
ELMO	Eocene layer of mysterious origin
EMIC	Earth System Model of Intermediate Complexity
ENSO	El Niño/Southern Oscillation
EOF	empirical orthogonal function
EPICA	European Project for Ice Coring in Antarctica
ESRL	Earth System Research Laboratory
GCM	General Circulation Model
GFDL	Geophysical Fluid Dynamics Laboratory
GHCN	Global Historical Climatology Network
GHG	greenhouse gases
GHSZ	Gas Hydrate Stability Zone
GIA	glacial-isostatic adjustment
GIN	Greenland-Iceland-Norwegian
GISP2	Greenland Ice Sheet Project 2
GLIMS	Global Land Ice Measurements from Space
GLSDB	Global Lake Surface Database
GNAIW	Glacial North Atlantic Intermediate Water
GOGA	Global Ocean Global Atmosphere
GRACE	Gravity Recovery and Climate Experiment
GRIP	Greenland Ice Core Project
GSOP	Global Synthesis and Observations Panel
HSZ	Hydrate stability zone
ICESat	Ice, Cloud, and land Elevation Satellite
InSAR	Interferometric Synthetic Aperture Radar
IPCC	Intergovernmental Panel on Climate Change
IR	infrared
IRD	ice-rafted debris
ISOMIP	Ice Shelf–Ocean Model Intercomparison Project
ITCZ	Intertropical Convergence Zone
LGM	Last Glacial Maximum
LIG	last interglaciation period
LIS	Laurentide Ice Sheet
LSW	Labrador Sea water
mascon	mass concentration
MCA	Medieval Climate Anomaly
MDR	main development region
MIS	Marine Isotope Stage
ML	mixed layer
MOC	Midocean current
MWP	Medieval Warm Period; meltwater pulse

NADA	North American Drought Atlas
NADW	North Atlantic Deep Water
NAM	Northern Annular Mode
NAO	North Atlantic Oscillation, also Northern Annular Mode
NCAR CCM3	National Center for Atmospheric Research Community Climate System Model 3
NOAA	National Oceanic and Atmospheric Administration
NGRIP	North Greenland Ice core Project
NRC	National Research Council
PDB	Pee Dee Belemnite
PDO	Pacific Decadal Oscillation
PDSI	Palmer Drought Severity Index
PETM	Paleocene-Eocene Thermal Maximum
PMIP	Paleoclimate Modeling Intercomparison Project
POGA	Pacific Ocean Global Atmosphere
POGA-ML	Pacific Ocean Global Atmosphere Mixed Layer Ocean
P-E	Precipitation minus evapotranspiration
RCM	Regional Climate Model
RF	radiative forcing
RSL	relative sea level
SAP	Synthesis and Assessment Product
SICI	Small Ice Cap Instability
SLE	sea level equivalent
SLP	sea level pressure
SLR	sea level rise
SLT	sea level equivalent
SMOW	Standard Mean Ocean Water
SRALT	satellite radar altimetry
SST	sea surface temperature
TAGA	Tropical Atlantic Global Atmosphere
THC	Thermohaline Circulation
TNA	Tropical North Atlantic
UNFCCC	United Nations Framework Convention on Climate Change
USGS	U.S. Geological Survey
VOC	Volatile Organic Carbon
WAIS	West Antarctic Ice Sheet
WDCGG	World Data Centre for Greenhouse Gases
WGMS	World Glacier Monitoring Service
WMO	World Meteorological Organization
WOCE	World Ocean Circulation Experiment
20C3M	20th Century Climate in Coupled Models
Abbreviations	
a	year
BP	before present
dS/dt	surface elevation change with time
g	gram

G	giga
Gt	gigatonne
GtC	gigatonnes of carbon
hPa	hectoPascal
ka	thousand years (ago)
kyr	thousand years (ago)
kg	kilogram
km	kilometer
m	meter
Mg	megagram
mm	millimeters
Pa	Pascal
pCO₂	atmospheric partial pressure of CO ₂
ppb	parts per billion
ppmV	parts per million as measured in volume
ppm	parts per million
PW	petawatt
s	second
s.d.	standard deviation
Sv	sverdrup
T	tera
Tg	teragram
W	watt
yr	year
µm	micrometer
‰	per mil