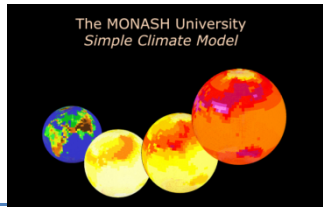

Climate change scenarios

Worksheet: Regional differences in warming

Introduction

Global warming causes a change in climate with severe consequences for humans and nature. The greenhouse gases emitted by humans are the main cause for this change in climate. Depending on how much greenhouse gases are emitted, scientists expect varying changes in climate on global and regional scales.

Since future changes in climate depend on social, economical, and technological development as well as the climate policy of the different nations of the Earth and therefore are not predictable, scientists developed different scenarios for future greenhouse gas emissions for the Intergovernmental Panel on Climate Change (IPCC) that describe possible futures of the climate. These so called RCP scenarios (**R**epresentative **C**oncentration **P**athways) are the basis for climate models which calculate future climate for a certain increase in greenhouse gas emissions.

RCP8.5 is the highest scenario in the IPCC, RCP2.6 is the lowest. Within RCP2.6, the increase in mean global temperature is limited to 2 °C. Thereby, a 'dangerous' climate change is prevented. The RCP3PD scenario, which is used in MSCM, is similar to RCP2.6 but allows a temporary increase in the radiative forcing of about 3 W/m^2 (PD is short for ‚peak and decline').

The RCP8.5 scenario

Compare the regional changes in the annual mean temperature in RCP8.5 for the year 2055. Fill out the table below for this purpose. In the middle column, fill in the change in temperature as a rough number (e.g. -2 bis -3 °C). Describe this change in words in the right column (e.g. low/ strong warming) and compare it to other regions (1 and 2, 3 and 4, 5 and 6).

Annual mean temperature in different regions			
Row	**Region**	**Warming in °C**	**Comparison of the assigned regions**
(1)	Continents	**Year:**	
(2)	Oceans	**Year:**	
(3)	High latitudes	**Year:**	

(4)	Lower latitudes	**Year:**	
(5)	Subtropical arid regions	**Year:**	
(6)	Humid tropics	**Year:**	

Explanations:

Find explanations for your observations of the regional varying warming! The results of the MSCM experiments in 'Deconstruct the Mean Climate' and the articles mentioned below will help you to solve this exercise. Explain the varying warming:

1. … of continents and oceans.
2. … of high and lower latitudes.
3. … of the dry subtropics and the humid tropics.

Summer- and winter temperatures in different regions			
Row	**Region**	**Warming in °C**	**Comparison of the assigned regions**
(1)	Continents in the high Northern latitudes	**Winter:**	
(2)	Continents in the high Northern latitudes	**Summer:**	
(3)	Arctic ocean	**Winter:**	
(4)	Arctic ocean	**Summer:**	
(5)	Southern ocean	**Winter:**	
(6)	Southern ocean	**Summer:**	

Explanations:

Find explanations for your observations of the regional varying warming in summer and winter! Pay attention to the different seasons in the Northern and Southern Hemisphere. The results of the MSCM experiments in 'Deconstruct the Mean Climate' and the articles mentioned below will help you to solve this exercise.

Helpful articles to work on the exercises

Article	Topic
RCP scenarios	About the background and assumptions for the RCP scenarios
Greenhouse gases	About the most important greenhouse gases and their residence time in the atmosphere
Carbon dioxide	About the most important anthropogenic greenhouse gas
Ice-albedo feedback	About the impact of ice and snow on the albedo and the consequences for the surface temperature
Evaporation	About the process of evaporation