The Bolin Centre

The Bolin Centre is a multi-disciplinary consortium of more than 300 scientists in Sweden that conduct research and graduate education related to the Earth’s climate. It was formed in 2006 by Stockholm University, the Swedish Royal Institute of Technology (KTH) and the Swedish Meteorological and Hydrological Institute (SMHI).

The Bolin Centre focus on extending and disseminating knowledge about the Earth’s natural climate system, climate variations, climate impacting processes, climate modelling, human impact on the climate and climate impacts on ecosystems, biodiversity and human conditions as well as how society can minimize negative impacts through responsible management.

The Bolin Centre for Climate Research is named in honour of Professor Bert Bolin of Stockholm University, a leader in climate and carbon cycle research and one of the founders of the Intergovernmental Panel on Climate Change (IPCC) which received the Nobel Peace Prize in 2007.
Ocean-atmosphere dynamics and climate
We do fundamental research on the dynamics of the atmosphere and oceans and their influence on climate. We apply and develop theory and conceptual models to gain insight into the underlying mechanisms that govern the oceanic and atmospheric circulation. This understanding is then used to interpret simulations using complex global climate models aimed at understand past and present climates as well as to predict future climate change.

Clouds, aerosols, turbulence and climate
We investigate the role of clouds, turbulence and aerosols in the climate system and develop approaches for representing them in large-scale models. We use experimental data from detailed laboratory experiments, extensive field campaigns and long-term observations, in combination with models ranging from molecular-scale to fully coupled Earth system models.

Hydrosphere, cryosphere and climate
Water circulation at or near Earth’s surface occurs by rainfall, evapotranspiration, surface water and groundwater flows. Frozen water forms snow cover, glaciers, ice sheets and permafrost. We study couplings between water in all physical states and climate systems. This includes effects of natural or man-made changes in land cover, vegetation and water flow paths. We also explore the effects of climate change on water borne flows of substances.

Biogeochemical cycles and climate
We study interactions between climate and carbon-nutrient cycles through Earth system modeling, experimental, and observational studies. Questions include: How much carbon dioxide and methane will be released from thawing permafrost on land and under the sea? How efficiently are carbon and nutrients used at the organism level to the global scale and across environmental and climatic gradients?

Historical to millennial climate variability
We reconstruct past climate evolution by investigating natural records such as marine, lake and terrestrial sediment cores, ice cores, cave deposits, tree rings, landforms and historical documents. By developing appropriate statistical methods and comparing with climate model simulations, we aim to better understand and interpret past climate variability on historical and millennial time scales.

Deep time climate variability
To appreciate the full range of Earth’s climate variability it is necessary to look far back into geologic time where we find intervals when the world has been much warmer and colder than today. Our mission is to reconstruct and interpret past climate variations on long timescales by comparing computer simulations and data from natural archives such as rocks, sediments and fossils. This helps us place limits on natural climate variability and better understand the Earth system.

Landscape processes and climate
The combined effects of changes in climate, land-use and water-use may heavily influence natural resources in terrestrial and marine environments in the coming decades. To meet these challenges we bring together natural and social scientists to do coordinated research on ecosystems. We focus on multi-scale processes of climate, biodiversity, ecosystem services and adaptive governance across landscape.

Biodiversity and climate
We investigate how climate influences ecological and evolutionary processes in natural populations. Field observations and experiments are used to examine effects on abundance and distribution of single species, as well as how climate affect interactions between species, community structure and ecosystem functioning. We also use this information to develop methods to mitigate negative effects of climate change on biodiversity.