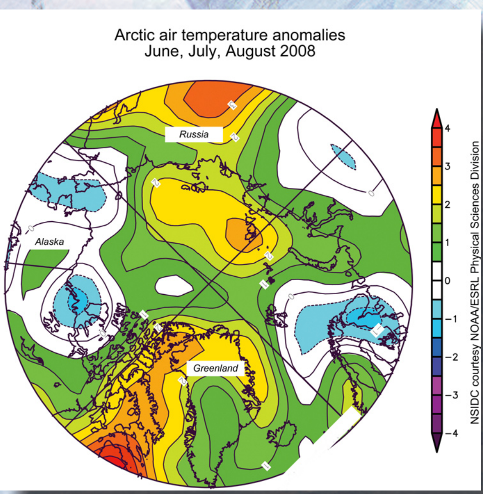
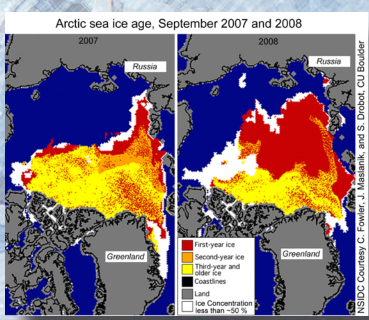
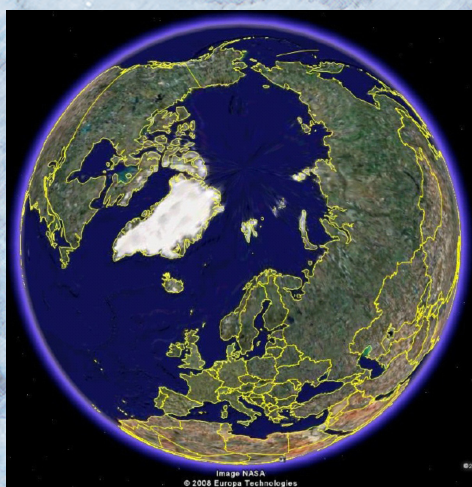
Understanding changes

Climate Change in the Arctic is more visible and develops faster than in any other part of the Earth. Arctic temperatures have increased at almost twice the global average rate over the past 100 years (IPCC, 2007). The permanent presence of sea ice, ice sheets snow and continuous permafrost are unique features of the polar regions and amplify the impact of global climate change on the regional physical climate systems. Changes observed over the past 2 -3 years have even far out-paced the most pessimistic of model predictions used in the 4th IPCC report. Humans are inextricably linked to the changes we are observing today, as drivers of change through greenhouse gas emissions and as the many populations needing to prepare for the uncertainties that lie ahead.

Over the last years continuous and remarkable signs of global warming have been clearly observed in the Arctic region, the most visible of which is the melting of marine ice during summer and the increase of vegetation coverage in the tundra. Observations indicate continuing trends in the state of several key physical components of the Arctic system, including the atmosphere, ocean, sea ice cover, and land. However, the variation trends of the different geophysical parameters are quite dissimilar from each other. The impact that, annually, abating forces of global warming may have on the climatic system are the most evident sign of its complexity and of the strong influence of retroaction processes and environmental conditions in the Arctic region. Because of the fundamental role that retroactive processes have in terms of global response of the system, many uncertainties remain in the parameterization of polar processes in the Global Circulation Models (GCM).







Scientific community became aware of the magnitude of recent environmental changes in the Arctic around the half of 90’. Since then, a significant development of both observational and modelling activities in the Arctic occurred. Key element of these efforts are the awareness that a multidisciplinary approach is fundamental for deepening our knowledge of the complex interactions/processes linking the different components of the Arctic system and provide a significant contribution for the improvement of their parameterization into climatic models.
Research strategy needs integrate ground observational networks and mobile platform (airborne, ship, drifting station) in order to obtain the spatial and temporal behaviour of the Arctic system. It establishes super-sites and carry out intensive multiplatform field campaign in order to measure the largest number of key parameters, and through closure experiments, it assess knowledge on many processes and evaluate uncertainties in their parameterizations.

As our knowledge on the Arctic System and strong interrelationship between its physical, chemical, biological and social components is improving, the need to gain an holistic perspective became more and more clear. Also clear is the need to develop a bipolar perspective to learn from similarities and differences between Arctic and Antarctic systems. A model including together geophysical, biological and social components will improve our predictive capabilities, thereby helping society to prepare for environmental change and its impact on humans and ecosystems.