National Report: CLIVAR research in the Netherlands

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Introduction

This is a national report from the Netherlands prepared for the meeting of the Scientific Steering Committee of CLIVAR (see www.clivar.org) in Buenos Aires, 19-22 April 2006.

The Netherlands has an extensive climate research program that ranges from fundamental research to applied research aimed at mitigation and environmental planning in the Netherlands.

Clivar-related research is performed by staff at various universities and institutes. In addition, Clivar-related research is supported by the Netherlands Organisation for Scientific Research (NWO) which has had a number of programs on climate variability and through a grant system has supported a substantial number of Phds and postdocs. It also funds a sea-going program.

In the following the main contributors to Clivar-related research in the Netherlands are described first. Some programs are high-lighted that show the potential of Dutch climate research related to Clivar. We limit the description to the research projects that started after the year 2000 except for those that are of directly motivated by Clivar (such as Clivarnet). In that case projects from 1998 onward are included.

The appendix shows research proposals granted by national funding agencies. The list is not limited to Clivar goals and implementation strategies, but includes the full range of climate research in the Netherlands. It shows that in addition to research on interannual to centennial actuo climate variability and predictability, there is a major contribution to palaeo-climate research, biogeochemistry and ice-climate research.

Universities and institutes that perform Clivar-related research.

1. University of Utrecht-Institute of Marine and Atmospheric Research (UU-IMAU)
www.phys.uu.nl/~wwwimau

The mission of the Institute for Marine and Atmospheric Research, Utrecht University (IMAU) is to contribute to the basic science of the oceans, atmosphere and cryosphere.
The research and teaching program is built around five themes: (1) Ice and climate, (2) Ocean circulation and climate, (3) Atmospheric physics and chemistry, (4) Atmospheric dynamics and boundary-layer meteorology, and (5) Physical geography and oceanography of the coastal zone.
The Ocean Circulation and climate group performs most of the Clivar-related research at the University of Utrecht. IMAU focuses on a few critical areas and issues, aiming at a better understanding of the wind-driven and thermohaline circulation in the oceans and their role in the maintenance of the global thermohaline circulation. Specific aspects, studied at IMAU are: non linear dynamics and modelling of the wind-driven and thermohaline circulation, circulation and interbasin exchanges in the Southern Ocean (modelling and remote sensing), water mass transformation and mixing processes in (sub) polar regions of the ocean and non linear dynamics of the coupled equatorial ocean-atmosphere system.

2. Royal Netherlands Institute for Sea Research (NIOZ)
www.nioz.nl
The Royal Netherlands Institute for Sea Research (NIOZ) is an independent research institute associated with the Netherlands Organisation for Scientific Research (NWO). Its mission is to pursue curiosity-driven multidisciplinary marine research in coastal and shelf seas as well as in the open ocean through close co-operation between physicists, chemists, geologists and biologists. Wherever possible, the institute engages in policy-focused and society-driven research. A large part of its research is dedicated to two themes: 1. Natural and Anthropogenic Climate Variability. 2. Ecology and Sustainability. Within these themes, the focus is on processes and mechanisms determining climate and ecology change. The results are relevant to support governmental management regarding the input of climate change on the society and the sustainable use of seas and oceans. The main contributor to Clivar is the physical oceanography department. The large-scale circulation as well as specific physical processes like tides, internal waves and turbulence are studied in the World Ocean, the North Sea and the Wadden Sea. In these studies use is made of hydrographic surveys by research vessels, monitoring of the ocean with moored instruments and remote sensing, instrumented commercial ships, and mathematical-physical analyses. Royal NIOZ operates and owns the ocean going R/V PELAGIA but can also procure ship time on the basis of ship time exchange or charter.
Number of CLIVAR related research positions (in physical oceanography department): about 5 in 2005 (incl PhD).

3. Royal Netherlands Meteorological Institute (KNMI)
www.knmi.nl
KNMI is the Dutch national institute for weather climate and seismology. KNMI provides weather information to society for safety, economy and sustainability. KNMI performs research on changes in climate for long term policies. Providing knowledge, data and information is KNMI's main activity. Climate research at KNMI is aimed at observing, understanding and predicting changes in the climate system. To help answer questions raised by society, climate research has the following objectives: i) To acquire the necessary observational data (monitoring) ii) A better understanding of the climate system, the causes of climate variations and the predictability of climate iii) Better predictions, in particular of natural variations (in as far as predictable) and of anthropogenic variations of the regional (West-European) climate and its extremes. Climate research is carried out in various divisions. The oceanography department and the climate variability research department are the main contributors to CLIVAR. Within these departments the role of the oceans and the impact of air-sea interaction on the climate system is investigated as well as the variability and predictability of weather and climate. In addition, KNMI hosts the Centre for Climate Research (CKO) model support group and provides advisory and information services on climate change issues
Clivar-related research focuses on numerical modelling of basin-scale and global ocean circulation and the coupled climate system. There is expertise in tropical climate dynamics, THC variability, ocean eddies and climate extremes. Furthermore, contributions are made to seasonal forecasting systems as well as to formulation of climate scenario's for Dutch climate, including sea level rise. Monitoring of climate consists primarily of contributions to monitoring of atmospheric composition from space and of a modest number of ARGO floats.

4. Others

In addition, a number of other universities and institutes contribute significantly to Dutch climate research. In particular mathematical and palaeo research communities are large.

- Centre for Mathematics and Computer Science (CWI, NWO institute)
- Eindhoven University of Technology, Transport physics
- Leiden University, Leiden Institute of Advanced Computer Science (LIACS)
- University of Amsterdam, Institute for Biodiversity and Ecosystem Dynamics (IBED)
- University of Groningen, Mathematics and Computing Science
- Utrecht University, Geosciences
- University of Twente, Applied Mathematics and Engineering Technology
- Vrije Universiteit Amsterdam, Earth and Life Sciences
- Wageningen University, Environmental Sciences

Government funded programs

1. Netherlands Organisation for Scientific Research (NWO)
www.nwo.nl/alw

The NWO has the following statutory mission. The Netherlands Organisation for Scientific Research is responsible for enhancing the quality and innovative nature of scientific research as equally initiating and stimulating new developments in scientific research, it mainly fulfils its task by allocating resources. It facilitates, for the benefit of society, the dissemination of knowledge from the results of research that it has initiated and stimulated. NWO mainly focuses on university research in performing its task.

Scientist can get funding from NWO through a grant system. Most projects on climate research are supported by the Earth and Life Science Research programs (NWO-ALW). ALW intends to further earth and life science research in the Netherlands by funding programs and projects within various research themes, as well as through open competition and funding of individual researchers. The thematic approach ensures stimulation of a wide range of research topics. ALW's Open Programme, which does not set any preconditions with respect to topics, as well as funding of individual creative and excellent researchers, is expected to encourage innovative research and open up new fields of study.
ALW research projects are often embedded in international research programs. ALW wants to play a part in setting priorities for the international research agenda and in improving Dutch scientists' access to international facilities. Furthermore, ALW is seeking to establish partnerships with other organisations. Partnerships make it easier to achieve the critical mass needed for research and strengthen the links between pure and applied research.

ALW strategy 2002-2005 in brief

- Nine new research themes
- Open ALW Programme
- Funding of individual researchers
- Investment in equipment
  Capital funding is to be made available for a new national equipment plan for maritime and genomics research etc.
- Internationalisation of research
  By 2005, approximately 15-20% of ALW funds should be allocated to combined international research programs.
- Partnerships
  Partnerships can strengthen the quality profiles of research programmes and broaden their financial base.

ALW Financial Strategy, budget per year

- Themes: M€ 13.5
- Open ALW Programme: M€ 9
- Funding of individual researchers: M€ 9
- Capital investments: M€ 3.4
- Facilities and co-ordination: M€ 5
- Administration expenses and reduced payment/early retirement scheme: M€ 2.7

These plans can only be implemented if the ALW budget is increased from a budget of M€ 24 in 2001 to M€ 43 by 2005.

An overview of the budget, duration and personnel funded in the ALW Climate Programmes of the past 5 years is given.

Thematic Climate Programmes NWO-ALW	Financing	Duration	Programme budget	Positions funded
CLIVARNET	NWO-ALW	1998-2005	2,0 M€	14 (7 PhD, 4 PostDoc, 3 other)
Theme research Climate Variability	NWO-ALW	2002-2008	1.8 M€	12 (2 PhD, 7 PostDoc, 3 other)
Climate Variability	NWO-ALW, NWO- EW, Ministry of VROM	2004-2011	5.2 M€	26 (17 PhD, 9 PostDoc)
Joint International RAPID Climate Change	NWO-ALW (NL) NERC (UK) RCN (NO)	2005-2009	1.1 M€ (NL funding)	5 (2 PhD, 3 PostDoc)
EUROCLIMATE	NWO-ALW	2005-2009	1.9 M€ (NL funding)	9 (3 PhD, 3 PostDoc, 3 other)
Total			*12,0 M€*	*66 (31 PhD, 26 PostDoc, 9 other)*

Climate variability related projects that are funded by NWO are presented in Appendix 1.

2. Others

- SRON is the Netherlands Institute for Space Research. It is the national center of expertise for the development and exploitation of satellite instruments in astrophysics and earth system science. It acts as the Dutch national agency for space research and as the national point of contact for ESA programmes. The main activities of the SRON institute are the development and exploitation of satellite instruments in high energy astrophysics, low energy astrophysics and earth system science. SRON is funded by NWO.
  NWO's Earth and Life Sciences Division cooperates with SRON in the Earth Observation Programme for earth-oriented space research.
  www.sron.nl

- The BSIK program Klimaat voor Ruimte is a public-private knowledge program. The program has as its goal to serve the government, industry and science with excellent and useful knowledge-infrastructure and innovative research. It focuses on the relation between climate and the use and strategic planning of public space. The program is organized around the themes climate scenario's, adaptation, mitigation, integration & communication.

- The European Commission funds in FP5 and FP6 a number of programs with Dutch participators. Most notably, programs as Ensembles and MerSea contain Dutch contributions. A more complete list of Dutch contributions to EC programmes is given in the appendix.
  http://europa.eu.int/comm/research/

Climate variability related projects supported by SRON, BSIK and EC are presented in Appendix 2.

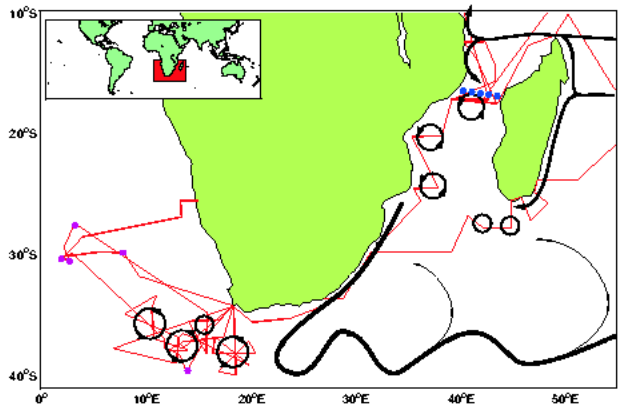
Recent Clivar-related research highlights

The Dutch Clivar-related research is strong in its cooperation between observationalists, numerical modellers and theoreticians in climate dynamics research. The MARE and the LOCO programs are prime examples of successful cooperation. Also, international cooperation within the RAPID program advances Dutch climate research. These projects are highlighted below. An extensive list of NWO funded projects and programs over the period of about 2000-2005 is found in Appendix 1.

1. MARE and ACSEX programs

The Mixing of Agulhas Rings Experiment (MARE, 1999-2004) and the Agulhas Current Sources Experiment (ACSEX, 2000-2001) were carried out by researchers from IMAU, NIOZ, KNMI and University of Cape Town. In MARE, the relevant processes related to the dissipation of rings from the Agulhas Leakage were studied. Three cruises dedicated to the evolution of one ring were performed, including paleoceanographic observations and numerical model studies. During ACSEX, two cruises were performed concentrating on the upstream developments in the Mozambique Channel and around Madagascar. During MARE, model studies have suggested that 90 percent of the upper water layers that cross the Atlantic equator northward are drawn from the Indian Ocean via the Agulhas Leakage.
Just before the first MARE cruise, a large ring with an initial diameter of 300 kilometers was shed from this retroflection area in January 2000. MARE surveys in March and August 2000 and February 2001 showed that the ring extended initially to the ocean bottom and had a surface velocity of 120 centimeters per second (cm/s) and a velocity of 10 cm/s at 5000 m. Five months later, the surface velocity had decreased to 80 cm/s and the ring structure had disappeared below 2500 meters. 40% of the ring's decay was related to cooling by air-sea interaction. Instability of the ring causes ring water to spiral out of the ring in thin filaments. To unravel the sensitivity of past Indian-Atlantic inter-ocean exchange to climate changes, the palaeo-record in ocean sediments at the ocean bottom was investigated. The modern MARE observations indicate that Agulhas rings carry a characteristic assemblage of Indian Ocean plankton. Sediment cores taken just west of the ring-shedding area indicate that leakage was enhanced during present and past interglacial periods and largely reduced or even ceased leakage during glacial periods. Maxima in leakage were recorded during the second half of the major deglaciations. The fossil record of Agulhas Leakage thus indicates that the flow of Indian Ocean water into the Atlantic has played a central role in the timing of interhemispheric climate changes and should be considered an important marine amplifier for the 100,000-year glacial-interglacial cycle.
www.nioz.nl/projects/mare
www.nioz.nl/projects/acsex

The tracks of MARE and ACSEX cruises and LOCO moorings



2. LOCO

In 2003 a consortium of physical oceanographers from different institutes in the Netherlands (NIOZ, KNMI and IMAU) initiated the program LOCO (Long-term Ocean Climate Observations).

Within LOCO the aim is to obtain long-term (5 years) observations on some aspects of the temporal variability in the global overturning ocean circulation. At some critical ocean locations measurements on inter-seasonal and inter-annual variability in ocean currents, convection and internal waves are carried out using sub-surface moorings. The program is embedded in the WCRP - CLIVAR programme and is funded by the Netherlands Organisation for Scientific Research (NWO). All in-situ observations are carried out by the Royal Netherlands Institute for Sea Research (NIOZ). In 2003-2004 long-term sub-surface moorings have been deployed in three areas: the Irminger Sea (convection and deep water formation), the Mozambique Channel (tropical-subtropical connection and control of inter-ocean exchange) and east Indonesia (part of the INSTANT program on the Indonesian Trough-flow). The observations from these moored systems will be used also to study spatial and temporal variability in the internal wave field. Additionally an array of 'internal wave moorings' is deployed for periods of 1-1.5 years at different locations in the North Atlantic ocean to study variability in internal wave climatology.

All sub-surface moorings have been serviced and redeployed in 2005 to continue these observations till at least 2008.
www.nioz.nl/loco

3. RAPID

The research councils of the UK, Norway and NWO-ALW have established a joint initiative for funding research related to the THC and rapid climate change in the North Atlantic region, which is linked to the UK-programme RAPID.
The ocean circulation (Thermohaline circulation, THC) in the North Atlantic plays a key role in the coupled ocean-atmosphere system which results in the present, relatively warm climate of western Europe. The Gulf Stream conveys warm surface water to high latitudes, where by cooling and high salinity it turns into deep water. There are indications that the system can change drastically on a time scale of one or two decades. This would have far-reaching consequences for the climate in Europe and northern America as well. Against the background of global climate change, the RAPID programme is aimed at the variability of this system and its sensitivity for changes in external forcing like wind-climate, temperature, atmospheric pressure, inflow of fresh water. The resulting changes in climate in the North Atlantic area are part of the programme as well, but not the impact of climate change. A detailed outline is presented in the Rapid Climate Change Science Plan and Implementation Plan, available from the UK-NERC RAPID homepage.
A prime activity in RAPID is monitoring of physical parameters in the North Atlantic. With funding from NERC (UK), NSF (USA) RCN (Norway) and NWO an extensive monitoring programme of the Meridional Overturning Circulation has been developed. In addition to ocean monitoring, modelling of ocean dynamics, ocean-atmosphere coupling and impacts on climate form part of RAPID, as does paleo-climatology.
http://rapid.nerc.ac.uk

Appendix 1: NWO supported climate variability related projects between ca. 2000-2005.

Abstracts of the listed projects are available from the NWO database of research projects at: www.nwo.nl/projecten.nsf/pages/losearch_eng

ALW - CLIVARNET
In the Netherlands a national CLIVAR committee was established in 1997. It envisaged strengthening of the national coherence, by enhancing collaborations between seagoing oceanographers and modellers, and between palaeoclimatologists and climate modellers.
NWO Climate Variability website: www.nwo.nl/klimaatvariabiliteit

- Decadal Climate variability related to the North-Atlantic Ocean.
  Prof. dr. ir. J.D. Opsteegh: Ir. M. van Reenen
  KNMI
- The tree of the Sea: climatic reconstructions on the basis of the bivalve Arctica islandica.
  Dr. H.J. Lindeboom: Dr. R. Witbaard, Dhr. J.A. van der Weele, Dhr. S.E.F. van Steenpaal
  NIOZ
- Climatic interpretation of glacier records by inverse modelling.
  Prof. dr. J. Oerlemans: Dr. E.J. Klok
  UU-IMAU
- Reconstruction of the natural variability of precipitation in the Netherlands and North Germany for the last 8000 years using ultra-long tree-ring chronologies of oak.
  Dr. E. Jansma: Dr. U.G.W. Klaassen-Sass
  RING/ROB, Nederlands Centrum voor Dendrochronologie
- Natural climate variability during the Late Galcial and late Holocene: comparison and integration of the marine and terrestrial record.
  Prof. dr. J.F. Vandenberghe
  VU-FALW
  - Natural climate variability in Late Glacial and late Holocene lacustrine records in northwestern Europe
    Dr. C.J. Beets: Dr. G. Aalbersberg
    VU FALW
  - Natural climate variability from Late Glacial and Late Holocene marine records offshore SE Greenland and on Reykjanes Ridge
    Dr. S.R. Troelstra: Dr. M.A. Prins
    VU-FALW
- Mixing of Agulhas Rings Experiment (MARE)
  Prof. dr. W.P.M. de Ruijter
  UU-IMAU
  www.nioz.nl/projects/mare
  - MARE A: Observations of Agulhas Ring Mixing
    Dr. C. Veth: Drs. A.K. van Veldhoven
    NIOZ
  - MARE B: Modelling and data assimilation of Agulhas Ring Mixing
    Prof. dr. W.P.M. de Ruijter: Dr. L. de Steur
    UU-IMAU
  - MARE C: Paleoceanographic observations of the Agulhas Ring Corridor
    Dr. J.H.F. Jansen: Dr. F.J.C. Peeters
    NIOZ
  - MARE D: Impact of Agulhas leakage on South Atlantic anomalies
    Prof. dr. W.P.M. de Ruijter : Drs. J.M.H. Donners, Dr. Drijfhout
    KNMI/UU-IMAU
  - MARE E: Impact of South Atlantic anomalies on European climate variability
    Dr. S.S. Drijfhout, Dr. W. Hazeleger
    KNMI
    (no NWO funding)

- Modern and historical climate lake-interactions recorded in remote arctic lakes
  Prof. dr. E. Koster: Dr. N.W. Willemse
  UU
- Coupling between atmospheric CO2 and temperature during the last millenium.
  Prof. dr. H. Visscher, Drs. T.B. van Hoof
  UU
- Analysis of ENSO-related variability in the equatorial Pacific in the 90's
  Dr. G.J.H. Burgers, Drs. H.D. Zelle
  KNMI

ALW - Theme research Climate Variability

- Propagation of equatorial climate variability of the Southwest Indian Ocean
  Prof. dr. W.P.M. de Ruijter, Drs. V. Palartanga, Dr. E.J. Machu, Dr. J.J. Nauw-van der Vegt
  UU-IMAU
- Tracing rapid monsoon change across the northwestern Arabian Sea: dust provenance as a monitor of teleconnective climate variation over the last 30 kyr
  Prof. dr. D. Kroon, Dr. S.J.A. Jung
  VU-FALW
- A new sea surface temperature proxy based on planktonic archaeal membrane lipids, the TEX86
  Dr. ir. S. Schouten, Mw. M.C. Huguet , Dhr. M.L Woltering
  NIOZ
- Does fluctuating solar UV-radiation amplify solar forcing of Holocence climatic shifts? Evidence from a new biological proxy in recent and fossil pollen and spores
  Prof. dr. J. Rozema, Dr. D. Yeloff, Dr. ing. P. Blokker
  VU-FALW
  dr. B. van Geel
  UvA - IBED
- Calibration of coccolith chemistry proxis for algal paleo-growth rate: application in the last 30kyrs in the western Arabian Sea upwelling system
  Dr. P. Ziveri, Dr. P. Ziveri, Drs. S.J.A. Verdegaal
  VU - FALW
- Tropical environmental change and its teleconnections during the last deglaciation: a lipid biomarker study dated with 14C wiggle-matching.
  Dr. G.J.M. Versteegh, Ing. M. Rietkerk
  NIOZ
- Holocene and last glacial decadal-to-centennial climate variability from near-equator lake sediments: a multi-proxy and inter-site comparison approach
  Prof. dr. H. Hooghiemstra, Dr. J.C. Berrio
  UvA - IBED

ALW / EW - Climate Variability Programme
Climate Variability is an NWO programme aimed at fundamental research in the field of climate problems. The programme is a continuation of a series of previous NWO programmes on this theme, issued jointly by the Divisions for Earth and Life Sciences and Physical Sciences, and also aims to support and promote multidisciplinary research at the interface of mathematics and/or informatics and climate science.

First round: 2004

- Symplectic Integration of Atmospheric Dynamics: Long-term Statistical Accuracy for Ensemble Climate Simulations.
  Dr. ir. J.E. Frank: Drs. S.B. Dubinkina
  CWI
- CLIMAtology of Deep Inertial Motions (CLIMA-DIM).
  Dr. J.J.M. van Haren, Dr. T. Gerkema
  NIOZ
- The role of finite-time instabilities in the interaction between stratosphere and troposphere.
  Dr. J. Barkmeijer: Ir. J.O. Hooghoudt
  KNMI
- El Nino in a changing climate
  Dr. G.J. van Oldenborgh: Drs. S.Y. Philip
  KNMI

- Land Surface Climate and the Role of the Stable Boundary Layer.
  Prof. dr. A.A.M. Holtslag, Drs. P. Baas, Dr. B.J.H vd Wiel
  WUR
- Changes in tropical Atlantic variability and its teleconnections.
  Dr. ir. W. Hazeleger : Dr. ir. W.P. Breugem
  KNMI
- Diagnostics and dynamics of the Circumglobal Waveguide Pattern.
  Dr. ir. F.M. Selten: Mw. P.K. Fung
  KNMI
- Transport and circulation around Madagascar.
  Dr. P.J. van Leeuwen: Ir. P.M. van der Werf : Dr. Mathijs Schouten
  UU-IMAU/ NIOZ
- Stability of carbon pools in far east Siberia.
  Prof. dr. A.J. Dolman, Dr. ir. M.K. van der Molen
  VU-FALW
- Does climate change affect the stability of the soil carbon sink in high-latitude peatlands?
  Prof. dr. R. Aerts: Drs. E. Dorrepaal
  VU-FALW

Second round: 2005

- Mechanism of European summer drying in present and future climate conditions
  Dr. B.J.J.M. van den Hurk and Prof. dr. A.J. Dolman
  KNMI / VU
- A new approach to the spin-up problem in ocean-climate models
  Dr. ir. F.W. Wubs and Prof. dr. ir. H.A. Dijkstra
  RuG / UU - IMAU
- Hamiltonian-based numerical methods in forced-dissipative climate predictions
  Dr. ir. O. Bokhove MSc and Dr. ir. J.E. Frank
  UT / CWI
- Lateral boundary conditions for nested models - mathematical and computational aspects
  Dr. A.A. Wolters and Drs. G.J. Cats
  LU – LIACS / KNMI
- Quantification of the indirect aerosol effect over Europe
  Dr. A.P. Siebesma
  KNMI
- A laboratory experiment to study the effect of turbulence on droplet growth and size distributions in clouds
  Dr. H.J.J. Jonker
  TUD
- Atmospheric variability and the Atlantic Multidecadal Oscillation
  Prof. dr. H.W. Broer and Prof. dr. ir. H.A. Dijkstra
  RuG / UU - IMAU
- SINDOCOM - Southern Indian Ocean/tropical Pacific teleconnections assessed by a joint coral - in situ ocean monitoring data base
  Prof. dr. D. Kroon and Dr. G.J.A. Brummer
  VU / NIOZ
- Experimental and model analysis of aerosol activation in the Netherlands
  Dr. G.J. Roelofs and Dr. H.M. ten Brink
  UU – IMAU / ECN

ALW - Joint NL/NO/UK programme RAPID Climate Change
The research councils of the UK, Norway and NWO-ALW have established a joint initiative for funding research related to the thermohaline circulation and rapid climate change in the North Atlantic region, which is linked to the UK-programme RAPID. Projects involving researchers from the Netherlands are listed.

- Variations of the Atlantic Meridional Ocerturning Circulation during rapid climate changes: calibration, modelling and palaeoceanographic observations (VAMOC)
  Dr. G.J.A. Brummer, Dhr. L.P. Jonkers
  NIOZ
  Dr. G.M. Ganssen, Dr. F.J.C. Peeters
  VU-FALW

- Mass balance and fresh water contribution of the Greenland ice sheet: a combined modelling and observational approach
  Dr. M. R. van den Broeke, Ir. J. Ettema
  UU-IMAU
- To what extent was the Little Ice Age a result of change in the thermohaline circulation?
  Dr. S.L. Weber, Dr. G. van der Schrier
  KNMI
- Impact of changing freshwater flows on the thermohaline circulation and European climate: analysis and modelling of the last glaciation
  Dr. H. Renssen, Dr. D. Roche
  VU-FALW

EUROCORES Euroclimate
Climate Variability and the (past, present and future) Carbon Cycle (EuroCLIMATE)
EuroCLIMATE is an ESF-EUROCORES programme that calls for basic research addressing climate variability and the carbon cycle (past, present and future), and in particular their interrelationship, in a European framework. It is supported particularly by research funding agencies from Austria, Belgium, Bulgaria, Denmark, Finland, France, Germany, The Netherlands, Spain, and Sweden, and by the European Science Foundation. Multi-proxy reconstructions from all available archives bring the marine, the terrestrial and the ice-core communities together on cross-cutting issues, such as obtaining a common timeframe, and will allow coupled climate models used for global warming scenarios to be validated on European and regional scales.
www.esf.org/euroclimate

- Development, calibration and application of independent salinity proxies (PaleoSalt)
  Dr. G.J. Reichart, Mw. A Duenas-Bohorquez
  UU
  Dr. ir. S. Schouten
  NIOZ
- Evaluation of the Ca Isotope System (d44Ca) in Carbonate Polymorphs as a new Proxy for Seawater Temperature and Secular Variations of Ca Concentration and Fractionation throughout Earth history (CASIOPEIA)
  Dr. A.M. Immenhauser, Dr. D. Hipples
  VU-FALW
- High-resolution reconstruction of late-Glacial and Holocene climate variability in equatorial East Africa based on laminated lake sediments from Mt. Kilimanjaro (CHALLACEA)
  Prof. dr. J.S. Sinninghe Damsté: Ing. J. Ossebaar
  UU
  Dr. B. van Geel: Drs. A. Lyaruu
  UvA IBED
- Quaternary marine ecosystem response to fertilization: Mediterranean sapropel events and implications for marine carbon uptake (MERF)
  Dr. P. Ziveri
  VU-FALW
- Rapid climatic and environmental shifts during oxygen isotope stages (OIS) 2 and 3 - linking high-resolution terrestrial, ice core and marine archives (RESOLuTION)
  Dr. H. Renssen: Drs. C.J.V.C. van Meerbeeck
  Dr. S.J.P. Bohncke: Dr. J.A.A. Bos
  VU-FALW

EUROCORES Euromargins
Processes at the Passive Continental Margins
EUROMARGINS is a EUROCORES Programme of the European Science Foundation (ESF) that focuses on the imaging, monitoring and modelling of the physical, chemical, and biological processes that are occurring in the passive continental margin.
www.esf.org/euromargins

- European carbonate margins as recorders of past global change: Cretaceous 'greenhouse' versus Carboniferous 'coldhouse' examples
  Dr. A.M. Immenhauser: Drs. B. van der Kooij
  VU-FALW
- Sedimentation Processes on the Portuguese Margin: The Role of Continental Climate, Ocean Circulation, Sea Level, and Neotectonics

Prof. dr. D. Kroon: Drs. G.J. Vis, Dr. P. Anand
VU-FALW

ALW / WOTRO - Programme Water
Within the theme System Earth, the NWO Division for Earth and Life Sciences (ALW) and the Netherlands Foundation for the Advancement of Tropical Research (WOTRO) together have launching a research programme for fundamental research regarding fresh water. In addition, the Ministry of VROM has allocated funds for fundamental research on climate change and its relation with society

- Groundwater control on climate
  Prof. dr. ir. M.F.P. Bierkens: Dhr. G. Adem, Dhr. G. Lam
  UU
- The effect of trade wind cumuli on the tropical large-scale circulation: A Dutch-German contribution to the RICO-program
  Dr. A.P. Siebesma: Dr. M.C. van Zanten
  KNMI

ALW - Netherlands Polar Programme (NPP)
In April 2002 the Cabinet decided to set up the Netherlands Polar Programme (NPP). In that way an Arctic component, the Netherlands Arctic Programme (NAP) was added to the Netherlands AntArctic Programme (NAAP), The assessment of subsidy applications, implementation and coordination of the Polar Programme is a task of NWO's Earth and Life Sciences Division (ALW).
www.nwo.nl/npp

Netherlands AntArctic Programme (NAAP)
Aim of NAAP: To promote high-quality scientific research at Antarctica. The Dutch contribution to Antarctic studies is also meant to underpin the Netherlands' voting membership of the Antarctic Treaty.

- Adaptation of Microorganisms to environmental change over the last 2,000 years; the fossil record in an Antarctic Firn Core.
  Dr. H. Bolhuis
  RuG
- An Ocean in Motion: consequences of climate change related shifts in temperature and mixing regimes for phytoplankton communities in the Southern Ocean.
  Dr. A.G.J. Buma
  RuG
- Comparing Crozet with the Antarctic peninsula: Effects of climate change on the ecosystem and colonization patterns of Deschampsia antarctica
  Dr. M van de Wouw
  NIOO-KNAW
- Distribution patterns of diatoms along altitudinal gradient on Marion Island, as indicators of climatic conditions
  Dr. A.H.L. Huiskes
  NIOO-KNAW
- Interpretation and measurements of isotopes and gas in Antarctica (deel A)
  Dr. R.S.W. van de Wal
  UU-IMAU
- Interpretation and measurements of isotopes and gas in Antarctica (deel B)
  Prof. dr. H.A.J. Meijer
  RuG- CIO
- Long-term, high resolution modelling of the climate and mass balance of the Antarctic ice sheet
  Dr. M.R. van den Broeke
  UU-IMAU
- Meteorological and climatological observations in DML
  Dr. M.R. van den Broeke
  UU- IMAU
- Southern Ocean Primary Productivity in a High-CO2 World
  Prof. dr. ir. H.J.W. de Baar
  NIOZ

Netherlands Arctic Programme (NAP)

The aim of the Arctic component in the NPP is to increase the national coherence of Dutch Arctic research in an international context.

- Climate of the west Greenland ablation zone: towards an IPY activity in 2008
  Dr. M.R. van den Broeke
  UU-IMAU
- Long term on-site isotope diffusion experiment
  Prof. dr. H.A.J. Meijer
  RuG
- Mass Balance observations on the Greenland ice sheet
  Dr. R.S.W. van de Wal
  UU
- Netherlands participation in the Greenland Climate Network (GC-NET)
  Dr. M.R. van den Broeke
  UU-IMAU
- Netherlands Participation in the Nordic Svalbard ice core drilling project 2003/2004
  Dr. R.S.W. van de Wal
  UU-IMAU
- Sea-ice pathways, sediments and climate
  Dr. S.R. Troelstra
  VU-FALW
- Responses of tundra plants to polar climatic change (temperature and solar UV-B): developing a high resolution climate proxy using annual growth of (sub)arctic woody shrubs long-term exposed to enhanced UV-B and warming
  Prof. dr. J. Rozema
  VU

ALW - Biodiversity in relation to Global Change

- Climate change and Indonesian coral reef biotas
  Dr. B.W. Hoeksema
  Nationaal Natuurhistorisch Museum Naturalis
- Climate induced biodiversity shifts in freshwater ecosystems - Experimental studies
  Dr. W.M. Mooij
  NIOO-KNAW
- Climate induced biodiversity shifts in freshwater ecosystems - models and time series analysis
  Prof. dr. M. Scheffer
  WUR
- Complex dynamics in time series of terrestrial plant diversity in relation to global change
  Prof. dr. H. Hooghiemstra
  UvA
- Effects of Climate change and N deposition on competition and carbon sequestration in bog systems
  Prof. dr. F. Berendse
  WUR
- Effects of elevated atmospheric Carbon Dioxide concentrations on the functional diversity of microbial communities in soil and feedback's to plant disease incidences in natural ecosystems
  Prof. dr. J.A. van Veen
  NIOO-KNAW
- Global Change and the Biodiversity of Cryptogams in Northern Biomes
  Dr. J.H.C. Cornelissen
  VU
- Model analysis of long-term effects of climate change on plant species composition and carbon sequestration in bogs
  Prof. dr. F. Berendse
  WUR
- Reconstruction of the effects of changing climate and human activities during the last 400 years on species composition and carbon sequestration in bog ecosystems
  Dr. B. van Geel
  UvA
- The Impact of Global Change on the Biological Diversity of the North Sea. Do invading species change the composition and function of the North Sea ecosystem?

Prof. dr. F.R. Schram
UvA

WOTRO / ALW - East Kalimantan Programme
The East Kalimantan Programme (EKP) aims to enhance and support long-term scientific cooperation in coastal zone research between research groups from Indonesia and the Netherlands. The geographical focus of the EKP is on the coastal areas of the Mahakam delta and the Berau region.

- Indonesian molluscs as monitors of rapid climatic (ENSO) and environmental change
  Dr. S.R. Troelstra
  VU
- Natural, climatic and anthropogenic change of the Berau Delta/Barrier Reef system: High-resolution coral proxy analysis of the modern environment and reconstruction on a seasonal to centennial timescale
  Dr. G.J.A. Brummer
  NIOZ

MaGW / ALW - Vulnerability, Adaptation and Mitigation
Social Aspects of Gradual and Abrupt Climate Change
VAM focuses on research into the social and behavioural aspects of climate change, particularly within and in cooperation between public administration, geography, environmental economics, socio-cultural sciences, environmental law, psychology and other disciplines. The programme is not intended for biological and ecological research.
www.nwo.nl/vam

- 'Getting down to business': Economic responses to climate change
  Prof. dr. J.E.M. Kolk
  UvA
- Adapting to climate-related natural hazards in building rural livelihoods in Mutarara District, Mozambique
  Dr. ir. D.J.M. Hilhorst
  WUR
- Analysing local climate vulnerability and local adaptation strategies
  Prof. dr. W.M. Lafferty
  UT
- Climate change impacts on inland navigation, an evaluation of adaptation strategies to cope with decreasing reliability
  Prof. dr. P. Rietveld
  VU
- Diffusion and adoption of CO2 reduction measures in the mainstream market of the built-up area: Reaching beyond the 2010 Kyoto targets.
  Dr. K.R.D. Lulofs
  UT
- Natural hazards, poverty traps, and adaptive livelihoods in Nicaragua.
  Dr. K. Burger
  Mansholt Graduate School
- The Application of the Precautionary Principle and Liability Law with Respect to Climate Change
  Prof. dr. E.I.L. Vos
  UM
- Trade-offs between adaptation and mitigation and the stability of international climate agreements
  Dr. R.B. Dellink
  WUR

ALW - Open Programme
The Open Programme of the Division for Earth and Life Sciences offers financial support across the full range of Dutch research in the earth and life sciences.

- Analysing Mid-Weichselian climate variability in N.W. European terrestrial systems by employing Chironomids as climate proxy

Dr. S.J.P. Bohncke
VU-FALW

- Climatic implications of the onset of Antarctic separation
  Prof. dr. H. Visscher
  UU
- Episodic sea-ice cover in the North Atlantic Ocean: implications for reconstruction of Late Quaternary climate changes.
  Dr. S.R. Troelstra
  Netherlands Research School of Sedimentary Geology
- From Greenhouse to Icehouse: reading the Arctic climatic record
  Dr. H. Brinkhuis
  UU
- High-resolution multi-proxy records of climate change during the Preboreal: evaluation of climate forcing factors
  Dr. B. van Geel
  UvA, IBED
- Holocene winter precipitation and summer temperatures in the Central Alps: reconstructing long-term NAO indices
  Prof. dr. A.F. Lotter
  UU
- Improving model situations of tropospheric nitrogen oxides and ozone.
  Dr. P.F.J. van Velthoven
  KNMI
- Intermittent turbulence in the atmospheric surface layer; a Dutch contribution to the International Project CASES.
  Prof. dr. A.A.M. Holtslag
  WUR
- Long-period orbital signatures in Neogene continental successions
  Dr. F.J. Hilgen
  UU
- Methane flux from northern wetlands at rapid climate transitions during the last glacial.
  Dr. J. van Huissteden
  VU-FALW
- Migration as possible constraint in adapting to climate change
  Prof. dr. M.E Visser
  NIOO-KNAW
- Palaeothermometry of the mid-Cretaceous greenhouse world using a new sea surface temperature proxy based on crenarchaeal membrane lipids
  Prof. dr. J.S. Sinninghe Damsté
  NIOZ
- Prominent uptake of anthropogenic CO2 by the Southern Ocean via Antarctic Intermediate Water
  Prof. dr. H. Thomas
  NIOZ
- Retroflection and ring formation of ocean currents
  Prof. dr. W.P.M. de Ruijter
  UU-IMAU
- Surface fluxes over heterogeneous land: the impact of temperature-humidity similarity on scintillometry.
  Prof. dr. A.A.M. Holtslag
  WUR
- The continental shelf pump: a pilot study in the North Sea.
  Prof. dr. H. Thomas
  NIOZ
- Theoretical analysis of 3D internal gravity and inertial waves.
  Dr. L.R.M. Maas
  NIOZ

NWO - Innovational Research Incentives Scheme
Veni, Vidi, Vici
The Innovational Research Incentives Scheme has been set up in 2000 by NWO, KNAW and the universities jointly. The aim is to promote innovation in the academic research field. The scheme is directed at providing encouragement for individual researchers and gives talented, creative

researchers the opportunity to conduct their own research programme independently and promote talented researchers to enter and remain committed to the scientific profession.

VICI

- Climate change, plant invasions and above-belowground interactions
  Prof. dr. ir. W.H. van der Putten
  NIOO-KNAW
- From hothouse to icehouse: Evolution of Mesozoic and Cenozoic sea water temperatures
  Dr. ir. S. Schouten
  NIOZ

VIDI

- Geodynamics & climate
  Dr. W. Krijgsman
  UU
- Marine methane flux and climate change: from biosphere to geosphere
  Dr. P.A.G. Regnier
  UU
- Milankovitch climate forcing and the Earth's rate of rotation
  Dr. L.J. Lourens
  UU
- Nature and origin of millennial-scale climate variability: new insights from numerical modelling and geological data
  Dr. H. Renssen
  VU-FALW
- The Global Marine Phosphorus Cycle: from Preservation Mechanisms in Sediments to Global Climate Change
  Dr. ir. C.P. Slomp
  UU
- The relation between atmospheric CO2, solar irradiance and ENSO activity during the last millennium
  Dr. F. Wagner
  UU

VENI

- Coupling geodynamic to climatic changes during Tibetan uplift
  Dr. G. Dupont-Nivet
  UU
- Ocean circulation and continental drift - A new systematic approach
  Dr. A.S. von der Heydt
  UU

NWO - National Research Cruise Programme - Shiptime
The National Research Cruise Programme is a subsidy form under the supervision of the Division for Earth and Life Sciences. It covers the additional costs of seagoing research expeditions.

NWO participates in IMAGES (www.images-pages.org) and the Integrated Ocean Drilling Program (IODP) through the European Consortium for Ocean Research Drilling (ECORD, www.ecord.org).

- Agulhas Current Sources Experiment (ACSEX), including shiptime Pelagia Around Africa (Mare, Pass-2).
  Prof. dr. W.P.M. de Ruijter
  UU
- GYROSCOP
  Dr. J.J.M. van Haren
  NIOZ
- Opstapper: ACSEX 2001
  Dr. G.M. Ganssen
- Opstapper: Gyroscop
  Dr. J.J.M. van Haren
  NIOZ
- Opstapper: IMAGES high frequency climate fluctuations Golf van Mexico.
  Drs. M. Saher
  VU

- Opstapper: Long-term Ocean Climate Observations (LOCO)
  Dr. G.J.A. Brummer
  NIOZ
- Opstapper: PABESIA cruise RV Sonne
  Prof. dr. J. Smit
  VU
- Opstapper: SUPO/IMAGES
  Dr. G.M. Ganssen
  VU
- Opstapper: Uptake CO2 in Southern Ocean
  Prof. dr. H. Thomas
  NIOZ
- Shiptime: The continental shelf pump: a pilot study in the North Sea.
  Prof. dr. H. Thomas
  NIOZ
- Shiptime: The role of foraminifera in benthic food webs and the marine carbon cycle
  Prof. dr. C.H.R. Heip
  NIOO-KNAW
- Slope mixing (Opstappers aanvraag)
  Dr. J.J.M. van Haren
  NIOZ

NWO - Investment Subsidy NWO Medium
For medium-sized investments in scientific apparatus the NWO Division for Earth and Life Sciences every year provides investment grants as part of NWO Medium, with the purpose of stimulating the investment policy of research institutes.

- Mass spectrometry facilities to allow measurements of 15 N and 13C, with special emphasis on the analysis of global change effects on N and C dynamics in plant communities and soil food webs
  Prof. dr. M.A.P.A. Aerts
  VU
- Oceanographic equipment
  Dr. J.J.M. van Haren
  NIOZ
- Observation Facility of the Oceans in a High-CO2 World
  Prof. dr. ir. H.J.W. de Baar
  RuG
- IODP Tahiti drilling
  Dr. J.A.M. Kenter
  VU-FALW
- The climate system and major perturbations in the global carbon cycle
  Prof. dr. D. Kroon
  VU-FALW

NWO - Investment Subsidy NWO Large
The purpose of investment subsidies is to promote a balanced national investment pattern and to encourage the investment policy of research institutes. Investment subsidies NWO-Large are aimed at investments larger than 900,000 euro.

- Equipment for Long-Term Ocean-Climate Observations (LOCO)
  Dr. H.M. van Aken
  NIOZ
  www.nioz.nl/loco

NCF - Computing time National Computing Facilities
The National Computing Facilities Foundation (NCF) grants subsidies for the use of national computing facilities.

- Atmospheric chemistry-climate modelling
  Prof. dr. H. Kelder
  TUE

- Global modelling of atmospheric transport and chemistry
  Dr. G.J. Roelofs
  UU-IMAU
- Ozone profile retrieval
  Drs. W.J. Som de Cerff
  KNMI
- Remote influences on European climate
  Prof. dr. ir. H.A. Dijkstra
  UU-IMAU
- Role of the exchange between Indian and Atlantic Oceans in the global ocean
  Dr. P.J. van Leeuwen
  UU-IMAU
- Role of the Indian Ocean in the Global Ocean circulation
  Dr. P.J. van Leeuwen
  UU-IMAU
- Simulation of extreme weather events, present and future
  Prof. dr. ir. H.A. Dijkstra
  UU-IMAU
- Simulation of Ocean Circulation changes during the Tertiary
  Prof. dr. ir. H.A. Dijkstra
  UU-IMAU

NCF - Grants Programme Parallelisation
The NCF Grants programme has a twofold objective:
- the parallelisation of existing scientific application software, or the (further) adapting of the programme code of scientific applications to the use on supercomputers, clusters and other parallel systems;
- the creation of a professional pool of qualified personnel able to conduct parallelisation efficiently.

- Parrallelisation of Antarctic Ice Sheet model
  Dr. R.S.W. van de Wal
  UU
- Parallelisation of MetCast
  Dr. J.R.A. Onvlee-Hooimeyer
  KNMI
- Parallelization of the chemistry module in an atmospheric large-eddy simulation
  Dr. J. Vilà-Guerau de Arellano
  WUR

NWO - Cooperation Russia
The Dutch Russian cooperation programme was established in 1992 to give a strong impulse to the scientific collaboration between the two countries.

- Climatic changes and their impacts on river systems in West and East Europe : comparison with the past and projection for the future
  Prof. dr. J.F. Vandenberghe
  VU
- Paleoenvironmental and paleogeographic evolution of the Black Sea area during the Neogene: Implications for Mediterranean-Paratethys exchange
  Prof. dr. C.G. Langereis
  UU
- Risk of extreme hydrometeorological events in low-lying areas of the North and the Caspian Seas
  Dr. ir. P.H.A.J.M. van Gelder
  TUD
- The evolution of biodiversity and soils in the Wetlands of Central Russia since the Younger Dryas (the last 11,000 14C years)
  Prof. dr. J.F. Vandenberghe
  VU
- The impact of climatic changes on ecosystems in Southern Siberia and Central Asia during the Time-interval 10000-2000 BP
  Dr. B. van Geel
  UvA

Projects in various other programmes

- Abrupt climate change and cultural transformation in Syria in late Prehistory (c. 6800-5800 BC)
  Prof. dr. P.M.M.G. Akkermans
  LU - Archaeology
  Subsidy-instrument : Open competitie Geesteswetenschappen
- Characterization of Hungarian Sources and Sinks of Atmospher CO2 Using Oxygen/Nitrogen Ratio and CO2 Measurements
  Prof. dr. H.A.J. Meijer
  RuG - CIO
  Subsidie-instrument : Samenwerking Hongarije
- Climate change and adaptive wate demand. Simulation of agricultural sector response to variability in water availability
  Ir. P.R. van Oel
  UT
  Subsidy-instrument : Reisbeurs
- Extreme-resolution Eemian climate variability of the tropics (Colombia); a search for driving forces and mechanisms at work.
  Prof. dr. H. Hooghiemstra
  UvA
  Subsidy-instrument : DC Fellowship
- Speleothem climate records: reconstructing ITCZ migration and El Niño -scale climate variation in the Peruvian Andes
  Dr. H.B. Vonhof
  VU
  Subsidy-instrument : WOTRO individual projects
- Understanding the Organic Carbon Pump in meso-scale ocean flows
  Prof. dr. S.A.L.M. Kooijman
  VU
  Subsidy-instrument: Computational Life Sciences

Appendix 2: Other supported climate variability related projects

SRON / NWO-ALW – National User Support Programme – Earth Observation
The National User Support Programme (Programma Gebruikersondersteuning (GO) in Dutch) is governed jointly by SRON and the Netherlands Agency for Aerospace Programmes NIVR. The programme focuses on the use of data provided by European satellites operated by the European Space Agency ESA, which has a specific programme dealing with Earth Observations, or other European entities like Eumetsat. In addition, the GO programme supports the development and operation of the Dutch data-infrastructure for Earth observation NEONET.
www.sron.nl/external_research

Programma GO, round 2004

- Combined active and passive cloud remote sensing using CLOUDSAT and CALYPSO
  Dr. D. Donovan
  KNMI
- Use of rotational Raman Scattering to improve Ozone Profile retrieval Algorithms for nadir pointing spectrometers (URSOPA)
  Dr. J.F. de Haan
  KNMI
- Improving Methane Emission estimates Aided by Satellite data (IMEAS)
  Dr. M. Krol
  IMAU/UU
- Dynamics and sensitivities of the Indian-Atlantic Ocean exchange using altimetry and GOCE gravity observations
  Dr. P.J. van Leeuwen
  IMAU/UU
- High-resolution 2D water vapour field estimation by permanent GPS networks in combination with Envisat-MERIS data
  Dr.ir. H. van der Marel
  TUD
- Tropospheric Ozone Re-Analysis (TORA)
  Dr. M. van Weele
  KNMI

Programme GO, round 2003

- Modeling radiation, heat and mass (water vapour and carbon) exchanges at the land-atmosphere interface using multi-angular optical and thermal measurements
  dr. Z. Su
  Alterra-WUR
- Ozone Monitoring Instrument cloud product validation and interpretation (OMI-Clouds)”
  dr. P. Stammes
  KNMI
- Synthesis of active and passive measurements for atmospheric model improvement (Synthesis)
  dr. A. Feijt
  KNMI
- Identification and modelling of sea level change contributors”
  prof.ir. B.A.C. Ambrosius
  TUD
- Synergistic use of AATSR, MSG and ground based data to provide user required aerosol products and application to the aerosol direct radiative effect on climate and air quality (SAMEN)
  prof.dr. G. de Leeuw
  TNO

- Improved quantification of Southern Ocean diatoms as indicators for Carbon fixation (KERGUELEN)
  dr. H. van der Woerd
  IVM/VU

Programme GO-2, round 2002

- Validation of SCIAMACHY and OMI NO2 and aerosol data using Dutch ground based measurements
  P. Levelt
  KNMI
- Characterizing the space-time variability of rainfall across a range of scales using state-of-the-art ground-based weather radars operating at complementary resolutions
  R. Uijlenhoet
  WUR
- Climate-chemistry interactions and the role of increasing greenhouse gases on the atmospheric ozone budget
  Bregman
  KNMI
- FRESCO+: an improved O2 A-band algorithm for retrieval of cloud properties from GOME and SCIAMACHY
  P. Stammes
  KNMI
- Radar - lidar synergy for space-based retrievals of water cloud parameters
  H.W.J. Russchenberg
  TUD
- SCIALINA: Ozone profile retrieval from combined limb- and nadir observations from SCIAMACHY
  R.F. van Oss
  KNMI
- Laboratory study of oxygen collision-induced resonances in support of ozone column retrieval from OMI satellite data
  W. Ubachs
  VU
- OPAES: Optimal estimation of primary aerosol emissions from satellites
  A.W. Heemink
  TUD
- Satellite-derived geoid anomalies due to glacial isostatic adjustment and secular sea-level variations
  R. Koop
  SRON
- Retrieval of aerosol properties from satellite data
  J. Landgraf
  SRON

Programme GO, round 2001

- Retrieval of ice and water cloud properties from SCIAMACHY's near-IR channels (SCIA-CIRRUS)
  P. Stammes
  KNMI
- Data Assimilation of Radiances for Ozone Profile Estimation (DROP)
  H. Kelder
  KNMI

- Modeling heat exchanges at the land-atmosphere interface using multi-angular thermal measurements
  R. Feddes
  WUR
- Resolving spatial and temporal atmospheric water vapour structures using a ground based GPS receiver network
  S. Barlag
  KNMI
- Development of a radiative transfer model for SCIAMACHY limb measurements (SCIARALI) - Phase II
  H. Kelder
  KNMI
- Sensor Synergy Algorithms for CloudSat and PICASSO-CENA
  van Lammeren
  KNMI
- Validation and interpretation of SCIAMACHY's polarisation measurements (SCIA-POLARISATION)
  P. Stammes
  KNMI

BSIK Klimaat voor Ruimte
www.klimaatvoorruimte.nl

Subcluster 1: climate scenarios

- North Atlantic Ocean monitoring and modelling.
  Dr. Ir. H. Ridderinkhof
  NIOZ
- Monitoring and profiling with the Cabauw Experimental Site for Atmospheric Research (CESAR).
  Dr. Ir. H.W.J. Russchenberg,
  TUD –IRCTR
- Representation of soil moisture and root water uptake in climate models
  Prof. Dr. R.A. Feddes
  WUR
- The regional climate impact of aerosols
  Dr. H. ten Brink
  ECN
- Remote influences on European climate
  Dr. F.Selten,
  KNMI
- Climate scenarios of wind and precipitation for The Netherlands with a high-resolution regional climate.
  Dr. E. van Meijgaard
  KNMI
- Tailoring climate information for impact assessment
  Dr. Ir. B.J.J.M. van den Hurk
  KNMI
- Time series information
  Dr. Th.Brandsma
  KNMI
- Modeling and reconstructing precipitation and flood frequency in the Meuse catchment during the late Holocene
  Prof.Dr. J. Vandenberghe
  VU-FALW

Subcluster 2: mitigation

- Integrated observations and modelling of greenhouse gas budgets at the ecosystem level in The Netherlands
  Ir. E.J. Moors, Alterra & Prof. A.J. Dolman, VU
- Integrated observations and modelling of greenhouse gas budgets at the national level in The Netherlands
  Dr. R.W.A. Hutjes
  Alterra
- Soil carbon dynamics and variability at the landscape scale: its relation to aspects of spatial distribution in national emission databases
  Dr. G.J. Nabuurs
  Alterra
- An integrated framework to assess spatial and related implications of increased implementation of biomass delivery chains
- The effect of the spatial arrangement of wetlands on water quality improvement and carbon sequestration in a multifunctional land-use setting
  dr.ir. J.E. Vermaat
  VU FALW
- Spatial decision support for management of Dutch fen meadows
  dr. R. Janssen
  VU FALW

Subcluster 3: Adaptation

- Biodiversity in a changing environment: predicting spatio-temporal dynamics of vegetation
  prof.dr. M.A.P.A. Aerts
  VU
- Strategies for optimizing the nature conservation potential of the Dutch Ecological Network and the surrounding multifunctional farm landscape under predicted climate change scenarios
  dr. C.C. Vos
  WUR
- Adaptations in the NCP (Netherlands Continental Shelf)
- Adaptations to extreme events in transboundary river basins
  dr. J.C.J.H. Aerts
  VU
- Climate change impacts on inland transport systems, an evaluation of adaptation strategies
  prof.dr. P. Rietveld
  VU
- Financial arrangements for disaster losses under climate change.
  prof.dr.ir. P. Vellinga
  VU

Subcluster 4: Integration

- Designing national land use adaptation and mitigation strategies under changing climate conditions (VU)
  drs. E. Beinat
  VU
- Cost-Benefit analysis of adaptation and mitigation options for climate change: methods and applications
  prof.dr. E.C. van Ierland
  WUR
- PROFILES: PRObing an method to Facilitate the Interactive Linking of Expert knowledge to Stakeholder assessment
  dr. M. Hisschemöller
  VU FALW

EC projects in Environmental research themes (with NL partners)

European Research on Climate Change – Catalogue of FP6 Projects – Volume 1, European Commission, 2005

- AMMA - African Monsoon Multidisciplinary Analysis
  www.amma-eu.org
  KNMI
- CARBOEUROPE - Assessment of the European Terrestrial Carbon Balance
  www.carboeurope.org
  VU, ECN, ALTERRA, SRON, WUR, RuG
- CARBOOCEAN - Marine carbon sources and sinks assessment
  www.carboocean.org
  NIOZ, RuG
- ENSEMBLES - ENSEMBLE based Predictions of Climate Changes and their Impacts
  www.ensembles-eu.org
  KNMI, RIVM
- EPICA-MIS - New Paleoreconstructions from Antarctic Ice and Marine Records
  UU
- MILLENNIUM - European climate of the last millennium
  UU, KNMI
- NITROEUROPE – The nitrogen cycle and its influence on the European greenhouse gas balance
  www.neu.ceh.ac.uk
  ECN, ALTERRA, WUR, RIVM, UvA
- QUANTIFY - Quantifying the Climate Impact of Global and European Transport Systems
  www.pa.op.dlr.de/quantify/
  KNMI
- SCOUT-O3 - Stratosphere-Climate Links with Emphasis on the UTLS
  www.ozone-sec.ch.cam.ac.uk/scout_o3
  RIVM, KNMI
- STAR - Support for Tropical Atmospheric Research
  www.knmi.nl/samenw/star
  KNMI, TUE

European Research on Earth observation- FP5 environment research projects in Specific Programme on Energy, Environment and Sustainable Development (EESD)

- 6C - Carbonate chemistry, carbon cycle and climate change (a multidisciplinary view)
  NIOZ
- ACCROTELM - Abrupt climate changes recorded over the european land mass : multi-proxy records of late-holocene climate variability in europe.
  UvA IBED, RUG - CIO
  http://www2.glos.ac.uk/accrotelm
- ASSET - Assimilation of envisat data
  KNMI
- ATLANTIS - Atlantic sea level rise : adaptation to imaginable worst case climate change
  VU
- CLOUDMAP2
  Sub-gridscale parameterisation through the validation of data assimilation of cloud properties for weather prediction and climate modelling from fusion of EO and ground-based instruments
  www-research.ge.ucl.ac.uk/cloudmap2/
  KNMI
- CLOUD-NET - Development of european pilot network of stations for observing cloud profiles
  KNMI, TUD
- EPICA - European project for ice coring in antarctica (EPICA)
  UU-IMAU
- ENACT - Enhanced ocean data assimilation and climate prediction
  KNMI
- ERA-40 - A forty-year european re-analysis of the global atmosphere
  KNMI

- EUROCS - European project on cloud systems in climate models
  KNMI, UU-IMAU
- EVERGREEN Global Satellite Observation of Greenhouse gas emissions (EnVisat for Environmental Regulation of Greenhouse gases)
  www.knmi.nl/evergreen
  KNMI, SRON
- IRONAGES - Iron resources and oceanic nutrients - advancement of global environement simulations
  NIOZ, RuG
- MERSEA- Marine EnviRonment and Security for the European Area
  http://www.nersc.no/~mersea/
  UU-IMAU
- MOTIF - Models and observations to test climate feedbacks
  KNMI
- PACLIVA - Patterns of climate variability in the north atlantic
  NIOZ
- SPICE - Space borne measurements of arctic glaciers and implications for sea level
  UU
- STACCATO - Influence of stratosphere-troposphere exchange in a changing climate on atmospheric transport and oxidation capacity
  KNMI, UU-IMAU
- TRADEOFF - Aircraft emissions: contribution of different climate components to changes in radiative forcing-tradeoff to reduce atmospheric impact
  KNMI

Appendix 3: List of Abbreviations

Abbreviation	Full name
ACSEX	Agulhas Current Sources EXperiment
ALW	Earth and Life Sciences division of NWO
BSIK	Besluit Subsidies Investeringen Kennisinfrastructuur
CIO	Center for Isotope Research
CKO	Centre for Climate Research
CLIVAR	Climate variability and predictability
CWI	Centrum voor Wiskunde en Informatica (national research institute for Mathematics and Computer Science)
ECN	Energy research Centre of the Netherlands
ESA	European Space Agency
ESF	European Science Foundation
EUR	Erasmus University Rotterdam
EW	Physical Sciences division of NWO
FALW	Faculty of Earth and Life Sciences of the VU
IBED	Institute for Biodiversity and Ecosystem Dynamics
IMAU	Institute for Marine and Atmospheric research Utrecht
INSTANT	International Nusantara STratification ANd Transport program
IVM	Institute for Environmental Studies of the VU
KNMI	Royal Netherlands Meteorological Institute
LIACS	Leiden Institute of Advanced Computer Science
LOCO	Long-Term Ocean Climate Observations
LU	Leiden University
MaGW	Social Sciences division of NWO
MARE	Mixing of Agulhas Rings Experiment
NCF	Netherlands National Computing Facilities Foundation, foundation of NWO
NERC	Natural Environmental Research Council - UK
NIOO-KNAW	Netherlands Institute of Ecology
NIOZ	Royal Netherlands Institute for Sea Research
NSF	National Science Foundation - US
NWO	Netherlands Organisation for Scientific Research
RCN	Research Council of Norway
RIVM	National Institute for Public Health and the Environment
RuG	University of Groningen
SRON	Netherlands Institute for Space Research
THC	Thermohaline circulation
TNO	Netherlands Organisation for Applied Scientific Research
TUD	Delft University of Technology
TUE	Eindhoven University of Technology
UM	Maastricht University
UT	University of Twente
UU	Utrecht University
UvA	University of Amsterdam
VU	Vrij Universiteit Amsterdam
WCRP	World Climate Research Programme
WOTRO	Foundation for the Advancement of Tropical Research, foundation of NWO
WUR	Wageningen University (and Research Centre)