ENEA research activities in the Arctic region

January 2021


ENEA
in the Arctic

A short summary of the ENEA research activities in the Arctic region

ENEA, the Italian National Agency for New Technologies, Energy, and Sustainable Economic Development (http://www.enea.it), has been carrying out research in the Arctic since early 1990. Research activities have been devoted to different topics, and have involved different Arctic regions.

Main research areas include: climatology and palaeo-climatology, polar ozone processes, toxicology, oceanography, application of remote sensing techniques, atmospheric physics, biological oceanography, radio-ecology applied to the water column and sediments, geochronology, impact of pollution and micro-plastics on the seabed and the ecosystem. Studies have been made at fixed long-term sites, from ships, balloons, and using satellite data.

ENEA, together with other national and international Institutes, has been operating the Thule High Arctic Atmospheric Observatory, THAAO (http://www.thuleatmos-it.it), in North Western Greenland, since 1990. THAAO is dedicated to atmospheric physics and climate studies, and contributes to the Network for Detection of Atmospheric Composition Changes. The ENEA contributions are primarily relative to **polar ozone, clouds and surface radiation budget, and Arctic climate interactions**.

Studies, within collaborative projects, have been carried out at the Dirigibile Italia Research station at Ny Ålesund (Spitzbergen, Northern Norway). These studies were originally devoted to determining **radionuclides distribution in the ocean**, and more recently to **atmospheric physics, and ecological investigations on the impact of microplastics pollution in different environmental matrices and biota** (https://www.researchinsvalbard.no/search/result?q=aramis).

Measurements of the **ocean chlorophyll content by remote sensing and in situ** methods were made from different ships, starting in 2006 onboard a Polish ship. Since 2017, Arctic observations have been intensified thanks to the annual High North Oceanographic cruises, organized by the Italian Navy (https://www.marina.difesa.it/cosa-facciamo/per-la-ricerca/Pagine/high_north_20.aspx). During these field campaigns, sediment cores are collected to investigate the **seabed in relation to the water column, the impact of chemical and plastics pollution on the marine environment and the carbon sequestration processes**.

Two EU projects (Inuendo and CLEAR) evaluated the impact of xenobiotic compounds with hormone-like actions, also in correlation to climate change, on human fertility. Polychlorinated biphenyls (PCBs) and DDT are persistent organic pollutants (POPs) of anthropogenic origin that bioaccumulate especially in high rank predators of the aquatic food chain, man included. Inuit population in Greenland is one of the highest bio-persistent organochlorine exposed population in the world, because the traditional diet includes fatty tissues of the arctic marine biota. The two projects contributed to the knowledge of the **impact of environmental contaminants and climate change on human reproductive health in the Arctic** and elsewhere.

Several studies involved **retrieval of atmospheric and oceanographic properties in the Arctic by satellite**.

The ENEA Antarctic Technical Unit also participates in the management and operation of the **Italian icebreaker Laura Bassi** (https://www.inogs.it/en/node/1616), who is planned to carry out an oceanographic cruise in the Arctic during summer 2021.

Recently, as part of the Arctic Research Programme, the first national research program dedicated to the Arctic, the ECAPACand the SENTINEL Projects have been approved. ECAPAC (Effects of Changing Albedo and Precipitation on the Arctic Climate), coordinated by ENEA, intends to investigate the **role of changing precipitation and albedo in the Arctic climate**; SENTINEL (the impact of **sea ice diSappearance** on highEr North aTlantic clImate and **atmospheric bromiNe and mErcury cycLes**), led by CNR, includes an ENEA research unit.

Links

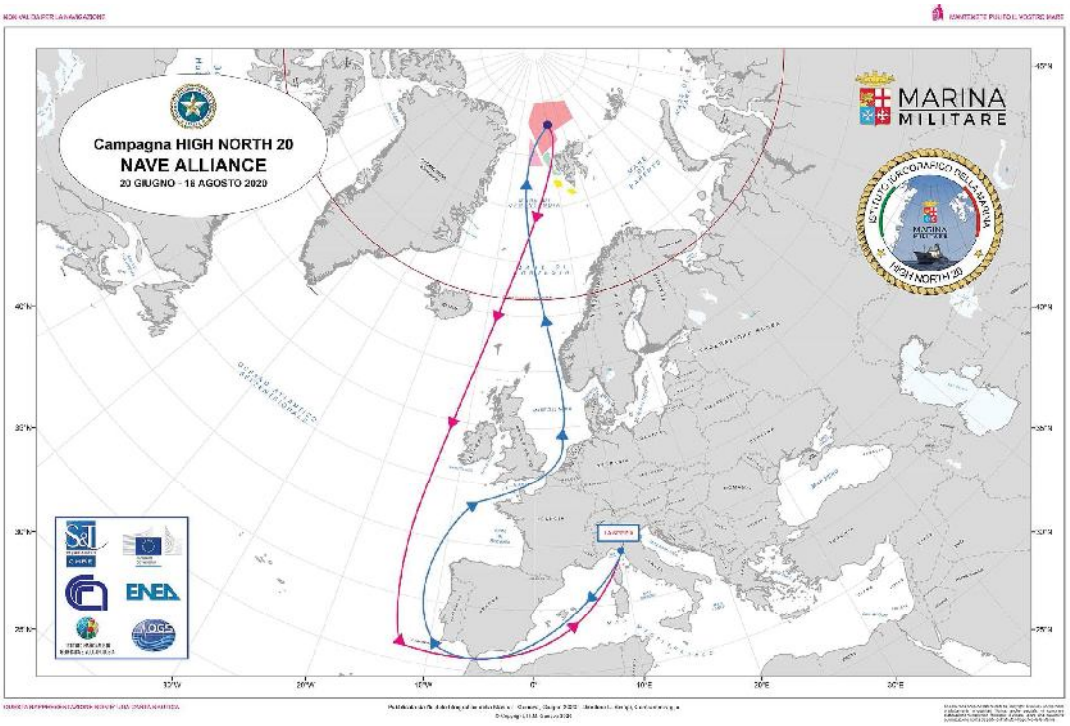
http://www.thuleatmos-it.it/
https://www.esteri.it/mae/resource/doc/2019/11/agenzia_nazionale_per_le_nuove_tecnologie_lenergia_e_lo_sviluppo_economico_sostenibile_enea__laser_per_il_monitoraggio_marino.pdf
https://www.researchinsvalbard.no/search/result?q=aramis
https://salute.sostenibilita.enea.it/projects/clear
https://cordis.europa.eu/project/id/QLK4-CT-2001-00202
https://cordis.europa.eu/project/id/226217/it

Outreach, communication

https://www.enea.it/it/Stampa/news/ambiente-allarme-microplastiche-nel-mar-artico-contaminati-i-crostacei
https://sostenibilita.enea.it/news/microplastiche-crostacei-mar-glaciale-artico
https://www.enea.it/en/news-enea/news/environment-high-north-20-italian-navy-and-enea-oceanographic-campaign-kicks-off
https://www.enea.it/it/Stampa/news/ambiente-destinazione-oceano-artico-al-via-campagna-high-north-20-della-marina-militare-con-enea
https://sostenibilita.enea.it/news/campagna-svaap-artico
https://www.enea.it/it/Stampa/eneainonda/11-09-2020-rai-news-24-futuro24-20-45-durata-00-03.41
https://www.enea.it/it/Stampa/eneainonda/30-07-2020-rai-3-tgr-liguria-19-35-durata-00-01.35
https://ambiente.sostenibilita.enea.it/news/enea-coordina-progetto-ecapac-tra-primi-progetti-finanziati-programma-ricerche-artico
https://ambiente.sostenibilita.enea.it/projects/clara-2

Sampling at the Svalbard to identify the presence of microplastic particles ingested by amphipod benthic species.

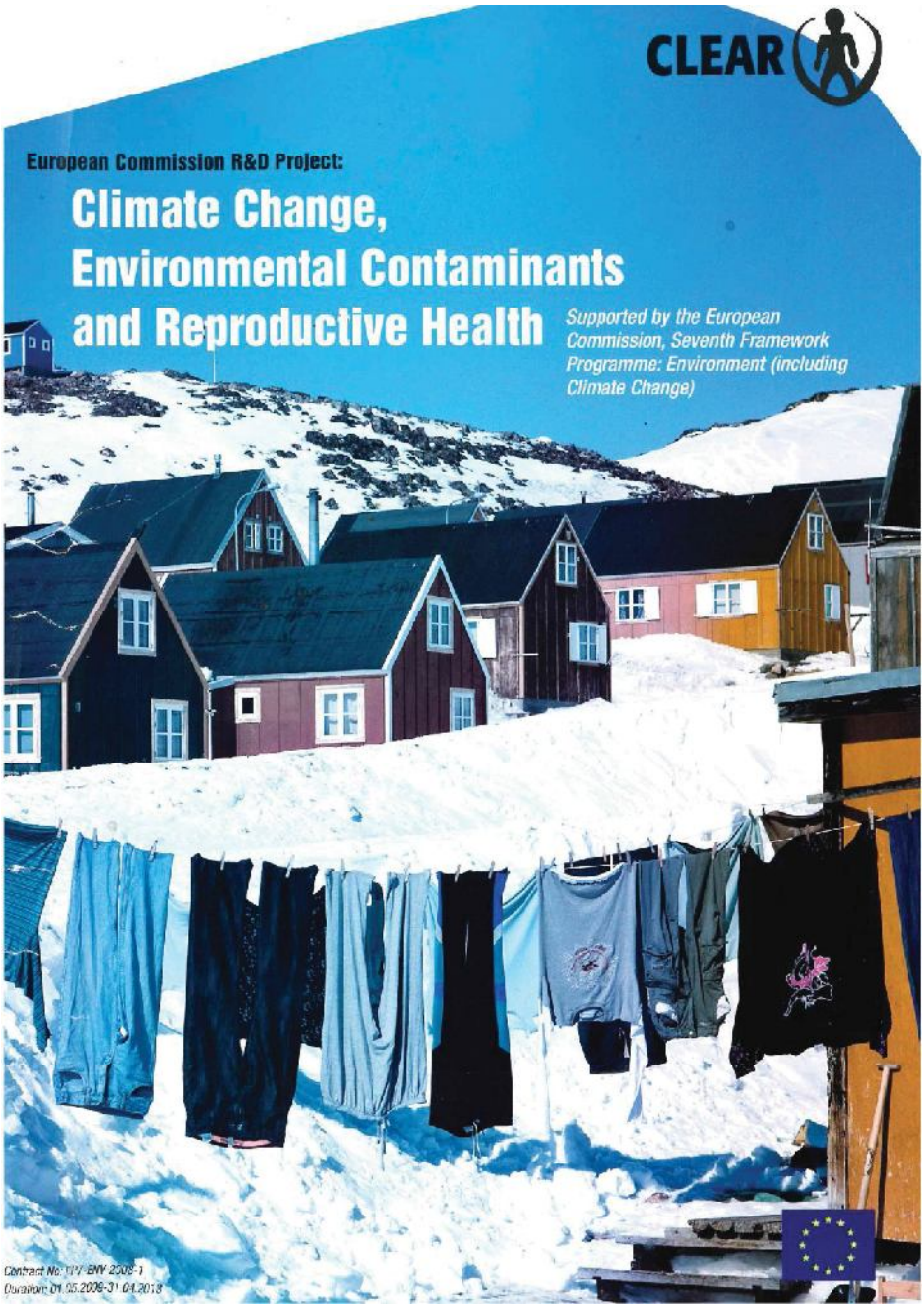
The Alliance ship in the Arctic.



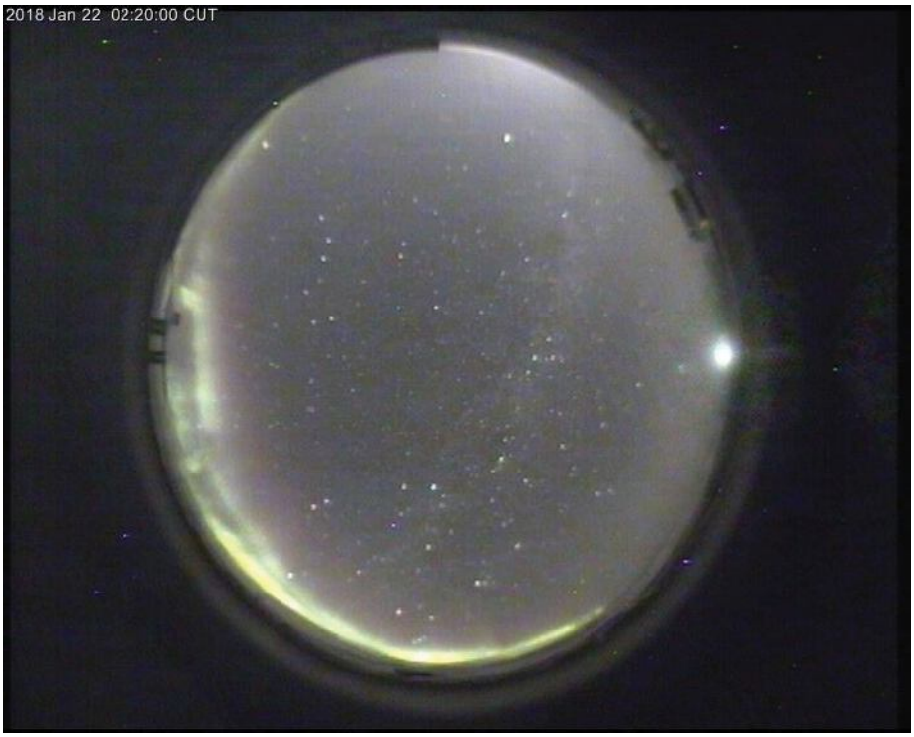
Track of the Alliance ship during the High North 2020 cruise during summer 2020.

Radiometers and microwave radiometer for the investigation of the atmospheric composition and radiation on the roof of the Thule High Arctic Atmospheric Observatory.

The laser beam of the aerosol-temperature lidar in operation from the Thule High Arctic Atmospheric Observatory.

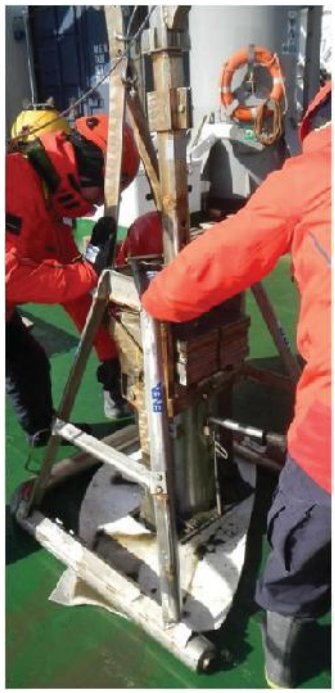

CLEAR
European Commission R&D Project:
Climate Change,
Environmental Contaminants
and Reproductive Health
Supported by the European Commission, Seventh Framework Programme: Environment (including Climate Change)

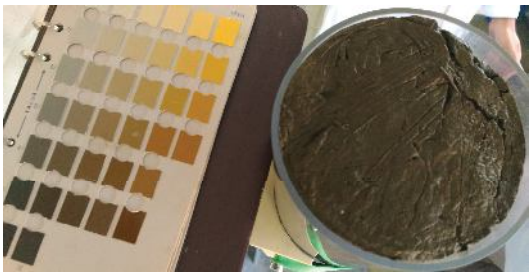
The right picture shows Marcello Spanò (1954-2017). He has been working in ENEA for over 30 years in the area of health protection, leading several European funded projects, among which "Inuendo" and "CLEAR". He sadly died at the age of 62 leaving an unbridgeable void in his colleagues and friends. For over 20 years he wove a network of lively scientific relationships with Scandinavian colleagues aimed at assessing the impact of environmental contaminants on reproductive health. An important portion of his research was devoted to assess environmental risks of indigenous Arctic population.



All-sky image from the Thule High Arctic Atmospheric Observatory. The picture is from 22 January, 2018, 2:22 UTC. An aurora is visible along the horizon.

The Cloud and Radiation in the Arctic and Antarctica is a research Project coordinated by ENEA and funded by the Italian Antarctic Programme (PNRA); it contributes to the international initiative Year of Polar Prediction with observations from THAAO.





Sediment cores sampled at various depths in the Arctic Ocean during the High North cruises for studies on sediment dynamics and carbon flows.

Scientific papers

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