

**Skisser med relevans innenfor  
Grunnleggende MNT**

**Tabell:** Oversikt over skisser med relevans for området **Grunnleggende MNT**

<b>Prosjekt-nummer</b>	<b>Prosjekttittel</b>	<b>Søkerinstitusjon</b>	<b>Prosjektleder</b>	<b>Estimert søkt beløp fra NFR</b>
316399	Norwegian participation in the ESFRI project European Solar Telescope (EST)	UiO (14 partner countries/Host: Spain)	Mats Carlsson	97 325 000
316435	The Goldschmidt Laboratory II: Advanced Characterization of Earth Materials	UiO (SINTEF, NGU)	Luca Menegon	54 110 000
316460	Troll Observing Network - skisse	NP (UiO, UiB, UNIS, NILU, NORSAR, NORCE)	Christina Alsvik Pedersen	186 701 000
316474	Cerenkov Telescope Array-Norway	UiB (NTNU, UiO)	Anna Lipniacka	33 395 000
316485	National Geoscientific Data Infrastructure	NGU (UiT, NTNU, UiO, UiB, NP, HVL, UNIS, Store Norske Spitsbergen Kullkompani AS)	Johannes de Beer	45 000 000
316541	European Plate Observing System - Norway (EPOS-N) Phase-II	UiB (NORCE, NORSAR, NGU, NMA, NGI, UiT)	Kuvvet Atakan	93 569 000
316581	Enabling LHC Physics at Extreme Collision Rates II	UiO (UiB, HVL, USN)	Alexander L. Read	100 579 000

**Prosjektnummer: 316399**

**Tittel:** Norwegian participation in the ESFRI project European Solar Telescope (EST)

**Søkerinstitusjon/partnere:** UiO (14 partner countries/Host: Spain)

**Prosjektleder:** Mats Carlsson

**Kort sammendrag:**

The purpose of the proposal is to secure the Norwegian participation in the ESFRI-project European Solar Telescope.

European solar physicists unanimously share the view that a large aperture new generation solar telescope is needed as a revolutionary step to unveil the fundamental processes in the Sun. To this aim, the European Solar Telescope (EST) was proposed in 2008 as a 4-meter class solar telescope to be located in the Canary Islands. The project was ranked as the highest priority, ground based, medium size (cost less than 500 MEUR) project in all of European Astronomy in the ASTRONET Infrastructure Roadmap for European Astronomy for 2010-2030. It formally entered the active project list of the ESFRI roadmap in March 2016 as the flagship project for the European Solar Physics community.

The preparatory phase (supported by EC project PRE-EST) is ongoing (2016-2020) with a budget of 15 MEUR. The construction phase is planned for 2021-2028 with a total cost of 185 MEUR and a Norwegian contribution of 5%.

For solar physics in Norway to stay at the absolute international research front, it is essential to keep access to cutting-edge infrastructure. EST is this infrastructure for European solar physics. The participation in EST is of the highest priority for the Institute of Theoretical Astrophysics, as evidenced by the institute having covered the Norwegian contribution to the preparatory phase (355 kEUR).

**Prosjektnummer: 316435**

**Tittel:** The Goldschmidt Laboratory II: Advanced Characterization of Earth Materials

**Søkerinstitusjon/partnere:** UiO (SINTEF, NGU)

**Prosjektleder:** Luca Menegon

**Kort sammendrag:**

In 1917, Victor Goldschmidt established 'Statens Råstofflaboratorium' at the Mineralogical Geological Museum, University of Oslo, which later was merged with the Geological Survey of Norway (NGU). It was funded directly from the Norwegian government to promote excellence in research with applications towards industrially important materials, notably the heat resistant mineral olivine. The Goldschmidt lab became a world leading research environment, made geochemistry a new science discipline, and Norway became the world's leading producer of olivine. Today, the University of Oslo hosts Scandinavia's strongest and most productive research environments within Solid Earth Geoscience with two Centers of Excellence (CEED and PGP), two ERC Advanced grants (Torsvik and Jamtveit) and two ERC startup grants since 2010. Earth and Environmental Sciences at UiO was recently ranked #3 in Europe outside UK in the 2020 Nature Index Tables. Still, research and research infrastructure directed towards Solid Earth Materials remain fragmented and poorly coordinated. Key analytical facilities are lacking or on the verge of being outdated. In 2018, a new initiative was launched to establish a state-of-the-art infrastructure within geochemistry and material science in the spirit of 'Statens Råstofflaboratorium'. It was named The Goldschmidt Laboratory. In 2020, the Goldschmidt Laboratory received an initial 20 MNOK support from NFRs National Financing Initiative for Research Infrastructure based on the 2018 call. This funding will establish the geochronology part of the Goldschmidt Laboratory at the University of Oslo and the Geological Survey of Norway - a component hereafter referred to as Goldschmidt I. The current application, Goldschmidt II, is focused on establishing the main component of the Goldschmidt Laboratory: A modern high-tech laboratory

directed towards micro and nano-scale studies of Earth materials and other solid materials of high research and industrial relevance in collaboration with Centre for Materials Science and Nanotechnology (Departments of Physics and Chemistry, UiO), SINTEF with its institute SINTEF-Industry, and the Faculty of Odontology (UiO). This component is essential for the further development of world leading, solid earth focused research at UiO, an imperative to keep pace with the leading high-tech environments in solid earth science in Europe, including ETH-Zürich and Utrecht University which precede UiO in the European ranking of Earth and Environmental Sciences and which are well known for their worldleading infrastructures and laboratories.

**Prosjektnummer: 316460**

**Tittel:** Troll Observing Network - skisse

**Søkerinstitusjon/partnere:** NP (UiO, UiB, UNIS, NILU, NORSAR, NORCE)

**Prosjektleder:** Christina Alsvik Pedersen

**Kort sammendrag:**

The Troll Observing Network (TONE) is a comprehensive infrastructure centered around the Norwegian Troll Research Station (RS) in Dronning Maud Land (DML), and it will be an important element in global research efforts in this part of Antarctica. TONE will be developed as a state-of-the-art observatory for environmental observations and will provide access to the long-term time series and shared services to attract new and existing users to the station. The infrastructure encompasses major fields within Antarctic research and aims at efficient use of the station, increasing the impact of the Norwegian polar research and strengthening the strategic role of the Norwegian station in Antarctica. The research infrastructure provides access to data from, and shared services linked to, carefully selected instruments suited for studying and monitoring the atmosphere, terrestrial and marine environment. Overall it aims at closing the data gaps in Antarctic environmental observations in this particularly data-sparse region of Antarctica. Users of the infrastructure, including the partners in the network, will contribute to answering questions relating to climate change and sea-level change (ia. knowledge gaps identified in IPCCs Special Report on Ocean and Cryosphere in a Changing Climate), atmosphere dynamics, space weather effects, robustness of communication networks, quality of weather and climate models, and the effects of global changes on marine ecosystems. The new instrumentation and shared services will complement and expand the existing observation infrastructure at and around Troll RS, and allow for more complete, environmentally friendly and state-of-the-art observations. The in-situ shared research platforms include access to the observation platform provided by the Troll supply vessel, a state-of-the-art drone service, new mobile laboratory facilities and access to field instrumentation for research campaigns. These platforms will open up for new and cross-disciplinary use of the infrastructure and the station. Environmental impact and management is in focus throughout the proposed project. TONE data will inform management of the area. New smart instruments and shared services will lessen the environmental footprint of research activities in the area. Shared logistics, field instruments utilizing renewable energy, and assessment and mitigation of environmental impacts when installing infrastructure will be the norm. The partners involved in the project will bring in both their existing network and relevant experience from previous work in Antarctica, and together with the new users, the proposed new infrastructure will contribute to enhancing international research collaboration.

**Prosjektnummer: 316474**

**Tittel:** Cerenkov Telescope Array-Norway

**Søkerinstitusjon/partnere:** UiB (NTNU, UiO)

**Prosjektleder:** Anna Lipniacka

**Kort sammendrag:**

The Cherenkov Telescope Array Observatory (CTAO) will be a NEW international open observatory specialized in observing cosmic gamma rays from the entire Universe. It will have sensitivity 10 times higher than eXisting laboratories, and eXtremely rich scientific programme ranging from studying and mapping the very high energy phenomena in the Universe to the possible identification of the Dark Matter particles. Norway is active in the present pre-construction phase of the CTAO. and a member of CTA Consortium since 2012. There are faculty members at UiB, UiO and NTNU working on key science projects of CTA. The Norwegian CTA community has recently been strengthened by 2 FTE thanks to "Promising Young Researchers" grant from the Research Council of Norway. To fully eXploit our long-term investment we need to join the construction phase and secure privileged access to CTAO data and discoveries. This is the goal of the present application.

**Prosjektnummer: 316485**

**Tittel:** National Geoscientific Data Infrastructure

**Søkerinstitusjon/partnere:** NGU (UiT, NTNU, UiO, UiB, NP, HVL, UNIS, Store Norske Spitsbergen Kullkompani AS)

**Prosjektleder:** Johannes de Beer

**Kort sammendrag:**

“our habitable environment today depends on complex interactions between the surface and deep Earth, through rock, soil, rivers, oceans and atmosphere”

The above quotation reflects on some of the core challenges of our time: climate change, sustainable resourcing of the world and preserving natural diversity and ecosystem services. Understanding the Earth System is a key to forming strategies and policies to face those challenges. The Earth Sciences collectively cover a broad area of relevance to the UN Sustainability goals and are crucial for providing research and data necessary for the transition to a more sustainable, low emission society, and for handling the risks and hazards paving the road toward such. The Norwegian Geoscience community carries out research within the fields of understanding the deep dynamic processes in the earth; understanding the surface processes and landscape development; climate change and paleoclimate; primary and secondary (recycled) mineral resources; soils and agricultural resources; natural geochemical background and impact of anthropogenic pollution; groundwater; nature types and systems; marine geology and interactions with ecosystems; sea floor mineral resources; hydrocarbon resources and geohazards (in Norway: landslides and earthquakes). Collectively, this research has a steadily increasing impact on the choices we make to develop a society where the needs for human welfare are well integrated with a reduction of our environmental footprint. Through more than 100 years, millions of physical samples (rock specimens, fossils, drill cores, soil samples, etc.), geoscientific analyses and observations carried out by many institutions, have provided a large amount of data. The collective research potential provided by this geoscientific data is of national importance, both for scientific research and for applied research and development. Yet, there is a conspicuous lack of a nationwide infrastructure for both physical and digital storage of geoscientific data, including a national data management system. Absence of this infrastructure effectively hinders the findability, accessibility, interoperability, and reusability (FAIR-principles) of geoscientific data, one of the major pillars of the Norwegian Government’s research strategy<sup>2</sup>. The National Geoscientific Data Infrastructure (NGDI) will provide the necessary e-Infrastructure to enable geoscientific research data to be managed and curated in such a way that

full advantage of their potential for a wide range of applications can be achieved. NGDI will support and enhance the management and data sharing capabilities of research institutes, museums and universities that operate physical storage facilities and carry out geoscientific research. As recently commented in Nature: Store and share ancient rocks; geological samples must be archived for all if we are to solve the riddles of Earth's complex history<sup>3</sup>.

**Prosjektnummer: 316541**

**Tittel:** European Plate Observing System - Norway (EPOS-N) Phase-II

**Søkerinstitusjon/partnere:** UiB (NORCE, NORSAR, NGU, NMA, NGI, UiT)

**Prosjektleder:** Kuvvet Atakan

**Kort sammendrag:**

EPOS-Norway (EPOS-N: [www.epos-no.org](http://www.epos-no.org)) is the Norwegian node of the European Plate Observing System (EPOS) ERIC ([www.epos-ip.org](http://www.epos-ip.org)) – a distributed research infrastructure for Solid Earth Science in Europe. The goal of EPOS-N is to gather all Solid Earth Science data in Norway and to make this data available and accessible to the full geoscience community and public through the newly developed EPOS-N Portal. The first phase (Phase-I) of the project is now in its final year (2016–2020). In this proposal, we apply for funding for a second phase (Phase-II), where we expand with new partners, new datasets, and a wider range of applications. The added expertise of these new partners along with new equipment will significantly enhance the monitoring capacity within Solid Earth Science in Norway and the Arctic. In this proposal we aim to address the increased political and economic interest in the Barents Sea, the Svalbard Archipelago, and the surrounding areas. In EPOS-N Phase-II, an enhanced solid Earth monitoring capacity, together with access to a national solid Earth science database, will allow to establish a baseline in the Arctic for studies on geohazards and georesources. This is especially important seen from environmental perspectives. In Phase-II, we will improve the monitoring in the Arctic by procurement, installation, and facilitating data access from the following: Broadband Ocean Bottom Seismometers (OBS) for earthquake monitoring and subaerial slope instabilities in fjords (tsunami hazard), broadband seismometers for a new seismic array in Finnmark (seismic hazard) co-located with infrasound sensors for environmental monitoring, short-period seismometers for cryospheric research (climate change studies), magnetic observations and airborne electromagnetic instruments for a range of geoscience applications. EPOS-N Phase-II involves new partners: The Arctic University of Norway (UiT), Norwegian Geotechnical Institute (NGI) and a new group from NORCE (formerly Norut). In addition to the seismological, geodetic and geological/geophysical databases implemented in Phase-I, extended data and services from the new partner institutions will include: Geomagnetic data (Tromsø Geophysical Observatory, UiT), rock physics laboratory data for Earth's internal and atmosphere processes (Rock Physics Laboratory, UiT), InSAR data – integrated InSAR/GNSS velocity datasets, gravimetry data (NGU), OBS data (mainly campaign-based data collection offshore, including submarine slope instability surveys to improve knowledge of the tsunami hazard potential), and borehole data (energy-related boreholes and shallow boreholes for groundwater, and NADAG – National Page 866 of 1300 EPOS-Norway Phase-II Mandatory outline for INFRASTRUKTUR, RCN, 2020 3 Database). A particular focus is dedicated to developing infrastructure for providing access to tsunami hazard models (NGI) within Norwegian fjords – a major societal concern and interest

**Prosjektnummer: 316581**

**Tittel:** Enabling LHC Physics at Extreme Collision Rates II

**Søkerinstitusjon/partnere:** UiO (UiB, HVL, USN)

**Prosjektleder:** Alexander L. Read

**Kort sammendrag:**

The Large Hadron Collider (LHC) at CERN is one of the most successful international scientific infrastructures in the world, in particular famous for the discovery of the Higgs boson. In the years to come LHC will be upgraded to enable more advance physics searches and hopefully discoveries. The new High-Luminosity LHC aim to start operation in 2027. The upgraded intensity leads to 2-10 times higher collision rates delivered to the experiments as well as higher radiation doses. Norway is member of ATLAS and ALICE, two experiments that both will need to enhance their detectors, trigger systems, and computing systems accordingly. The first part (step 1) of the ALICE and ATLAS upgrades, NorLHC, have been funded by the RCN infrastructure program for the period 2018-2022. We hereby apply for the funds for the second period 2022-2027 NorLHCII (step 2), which will allow us to complete the hardware upgrade of the LHC experiments ALICE and ATLAS and maintain and prepare and upgrade the e-infrastructure for the experiments in the same period. HL-LHC is part of the ESFRI roadmap. The ALICE and ATLAS experiments at the LHC provide an internationally unique infrastructure to conduct research in high-energy physics, in which over 200 Norwegian scientist, engineers, PhD and Master students participate in the HENP and HEPP projects. For ALICE most of the NorLHC upgrade, comprised mainly of new readout electronics for the TPC and ITS sub-detectors, will be completed by spring of 2021. For NorLHCII the three innermost layers of the ITS will be replaced by super-thin wafer-size MAPS sensors, and a new forward calorimeter - FoCal - will be added in time for the high-luminosity running to start in 2027. For ATLAS, the upgrades are for HL-LHC and our contributions to the Inner Tracker. Funds from NorLHC have been used to build up laboratory facilities to enable us to build around 200 novel silicon pixel modules and test them. Funds from NorLHC-II will be necessary to cover the period of module construction and commissioning both hardware and personnel. After 5 years of operation, a significant part of the NorLHC e-infrastructure will need replacing and an upgrade in order to manage the 3-5 times higher luminosity starting in 2027. The einfrastructure is distributed globally, with the Norwegian contribution located at the Universities of Bergen and Oslo.