



Skandinaviens nordligaste tekniska universitet  
**Forskning & utbildning i världsklass**

# Rymden vid Luleå tekniska universitet

A photograph of a satellite in space, showing its metallic structure, solar panels, and a grid of small cylindrical components. The Earth's horizon is visible in the background, creating a sense of depth.

Luleå tekniska universitet är en stolt del av Sveriges rymdhuvudstad, Kiruna. Här samverkar vi kring både utbildning och forskning med flera av landets främsta rymdaktörer; Institutet för rymdfysik, EISCAT och SSC.



SKANDINAVIENS NORDLIGASTE  
tekniska universitet

# Olle Persson

Verksamhetsledare LTU



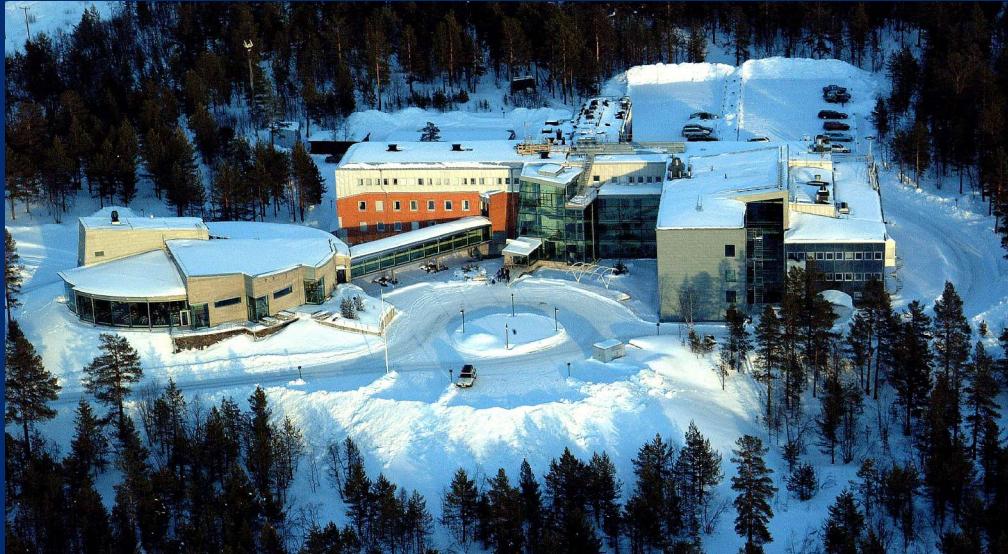


# Luleå tekniska universitet satsar på rymdutbildning och forskning

1. *“Rymden är ett framtidsområde, där Sverige har möjlighet att ta en europeisk tätposition”*
2. *2 nya forskningsområden inom rymd*
3. *Nya laboratorier*
4. Universitetsövergripande projektledare Rymd:  
*”Det strategiska arbetet ska stimulera klustering inom och ökad positionering och synliggörande av områdena.”*
  1. *Ståndpunkts-PM.*
  2. *Nationellt samverkansprogram.*
  3. *Expandera rymdforskningen och nya rymdutbildningar.*
  4. *Kommande rymdforskarskola, centrumbildning, RIT, Almedalen*



# Institutet för rymdfysik



## Syfte

IRF är en myndighet under Utbildningsdepartementet och bedriver grundforskning och forskarutbildning i rymdfysik, rymdteknik och atmosfärfysik.

IRF gör även tillämpad forskning i signalanalys, sensorteknik och satellitteknik.

Mätningar görs med satelliter, ballonger och markbaserade instrument (t ex radar och optiska instrument).

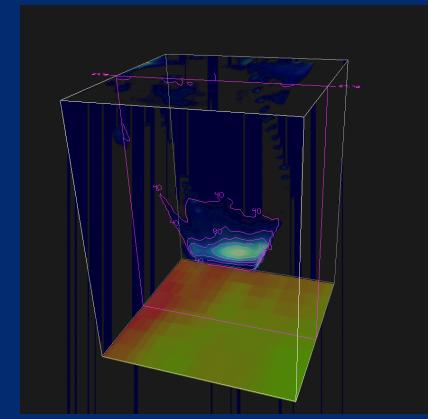
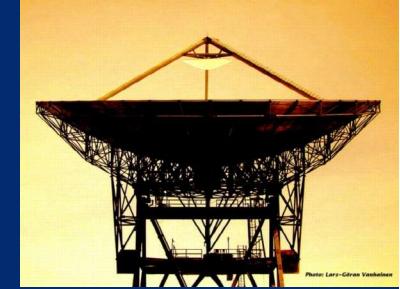
[www.irf.se](http://www.irf.se)



# Institutet för rymdfysik

## Framtida projekt

- EISCAT 3D
- ALIS 4D
- BepiColombo (2018) - en ESA/JAXA-mission till Merkurius
- Chang'e 4 (2018) – en kinesisk mission till Månen
- Solar Orbiter (2019) – en ESA-mission för att studera Solen
- MIST (2020) – KTH:s studentsatellit
- JUICE (2022) - en ESA-mission till Jupiters isiga månar
  
- SpaceLab
- Rymdväder





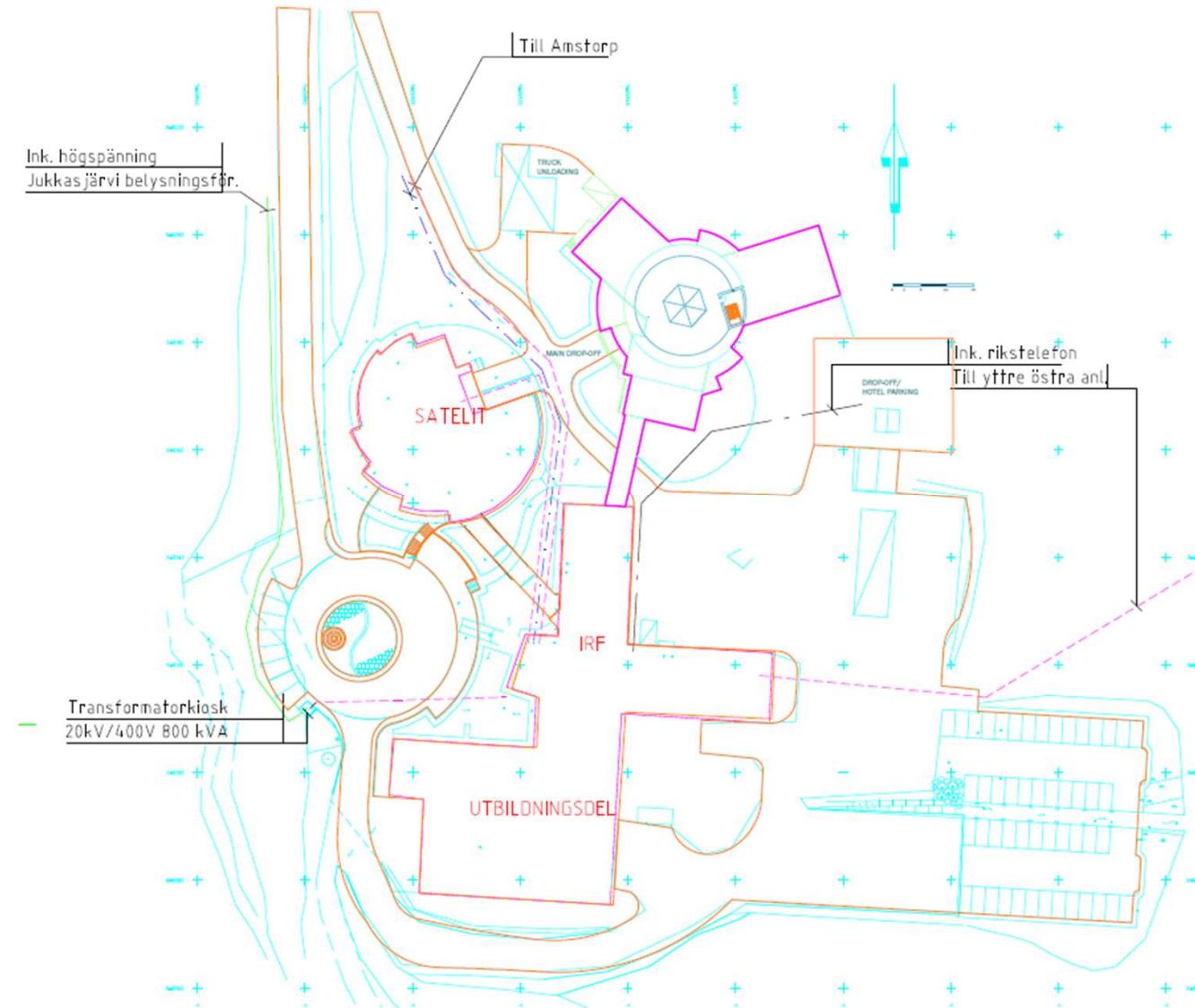
## SPACE LAB

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### Detailed technical specifications

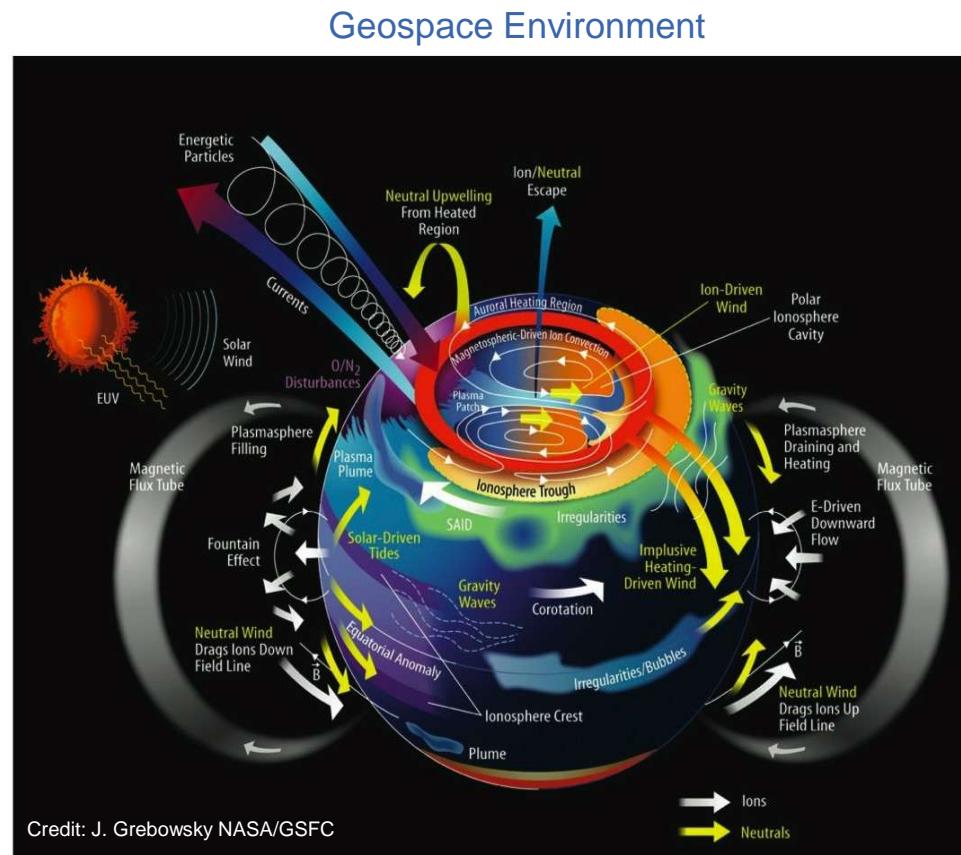
- Atmospheric chambers
- Mechanical testing in a semi-clean environment
- Radiation TID
- Calibration beam facility
- Solar simulator

# SPACE LAB



# EISCAT Scientific Association

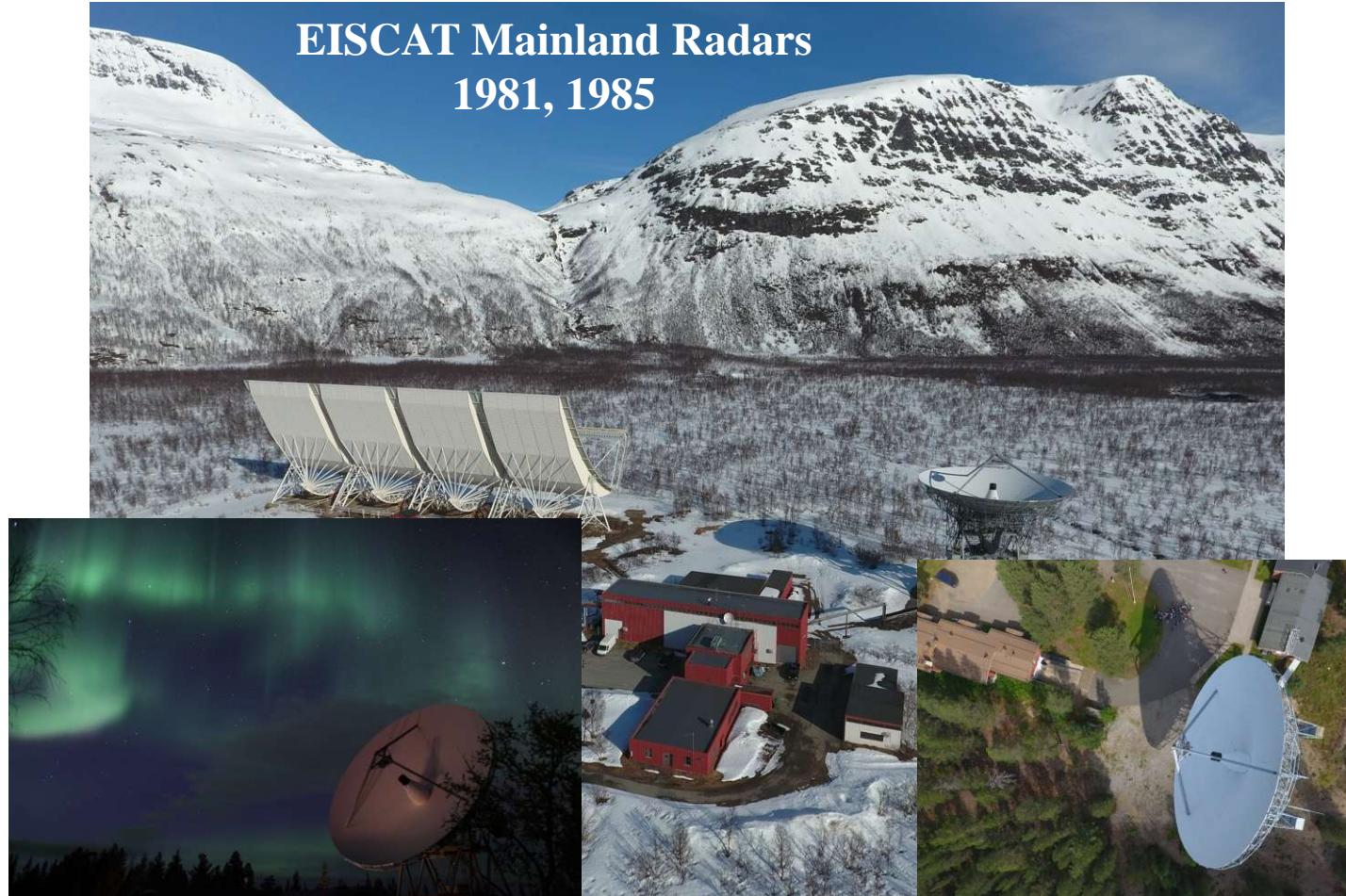
- European Incoherent SCATter
- Associates: China, Finland, Japan, Norway, Sweden, U.K.
- Affiliates: France, S. Korea, Ukraine
- Founded in 1975, first operations 1981, first Svalbard operations 1996
- "The aim of the Association is to provide access to radar, and other, high-latitude facilities of the highest technical standard for non-military scientific purposes".
- Locations: Tromsø (NO), Sodankylä (FI), Kiruna (SE), Longyearbyen (Svalbard).
- Headquarters in Kiruna, Sweden





# EISCAT Mainland

**EISCAT Mainland Radars  
1981, 1985**





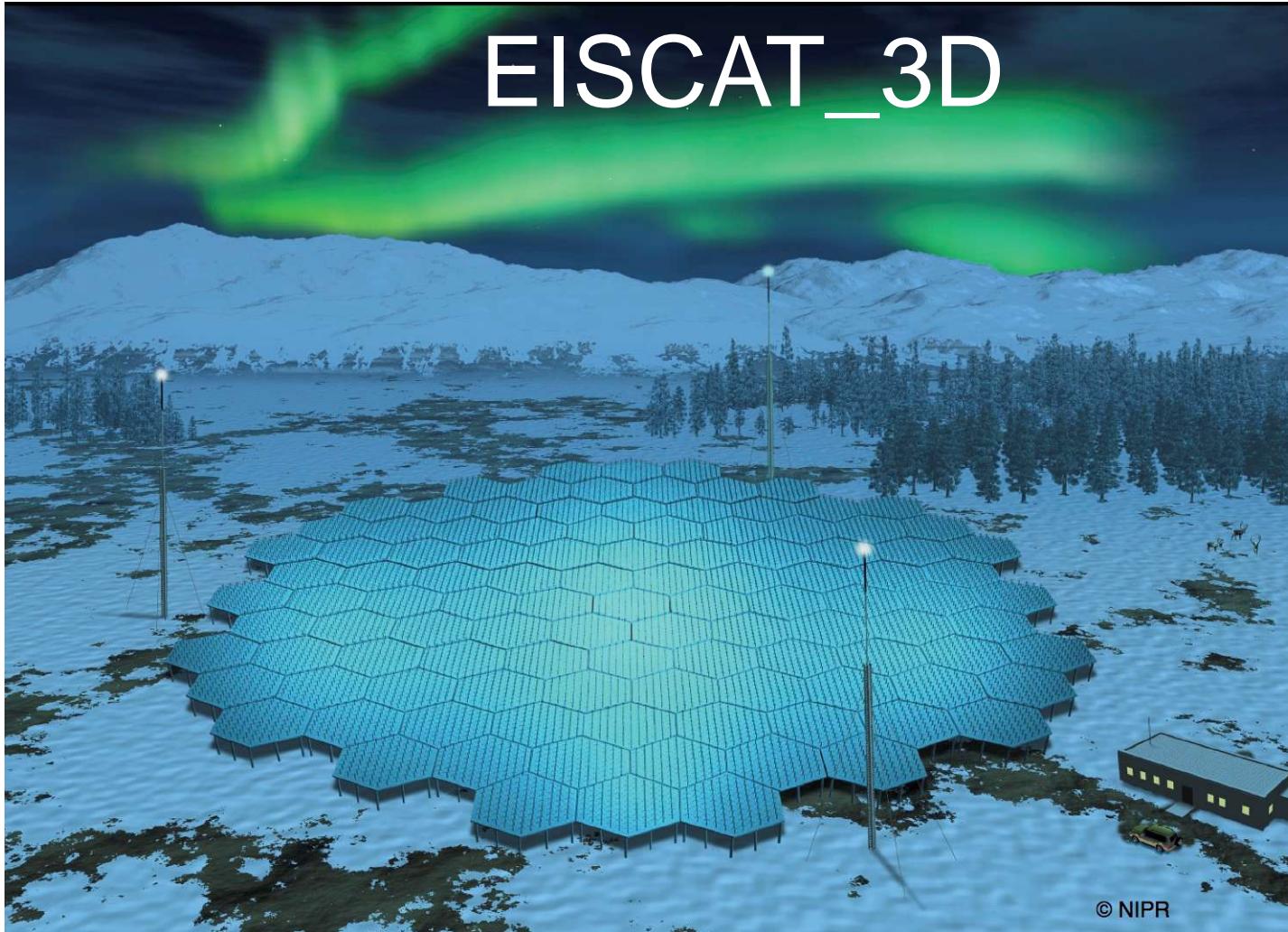
# EISCAT Svalbard Radar





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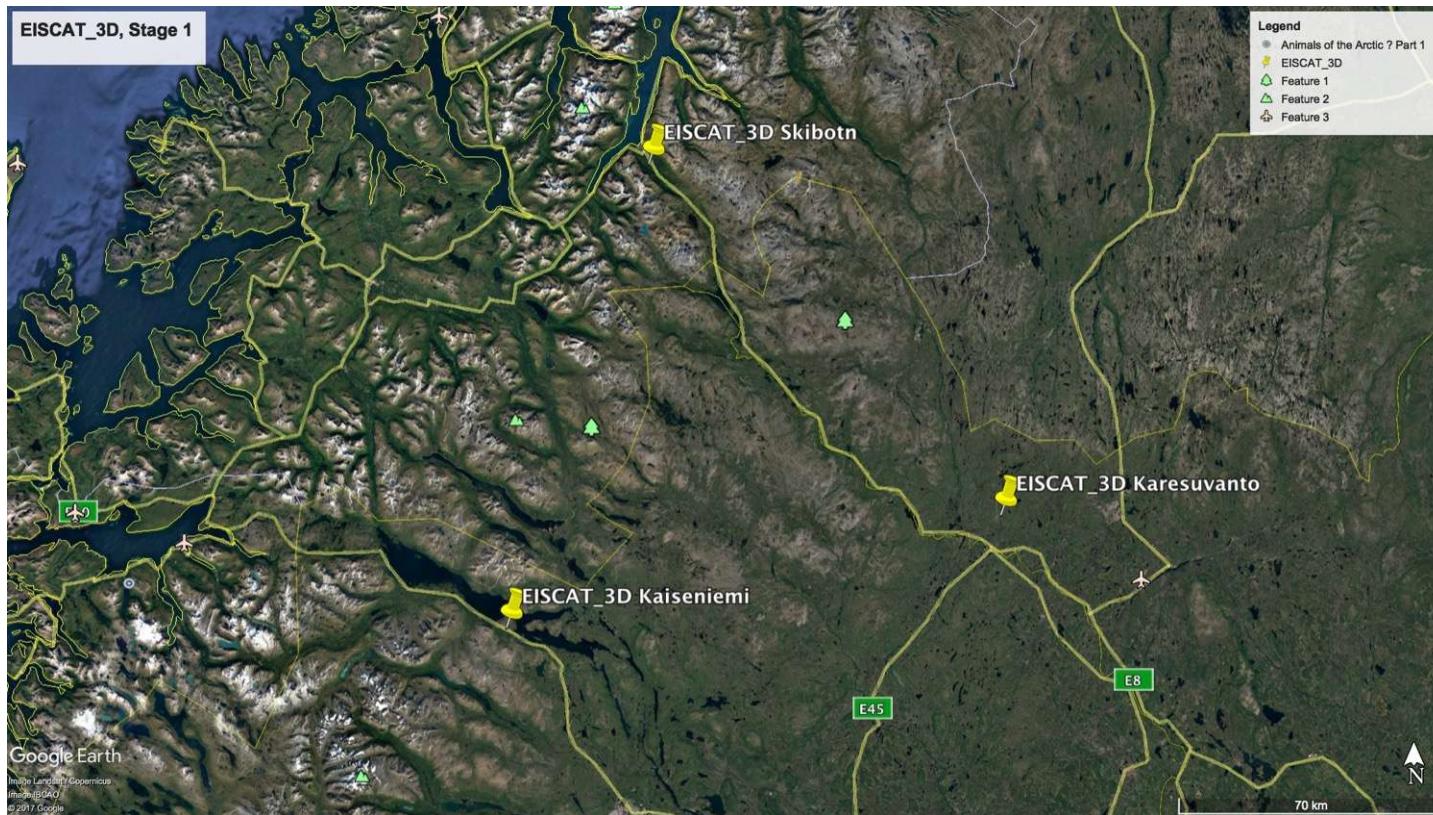
# EISCAT\_3D



© NIPR

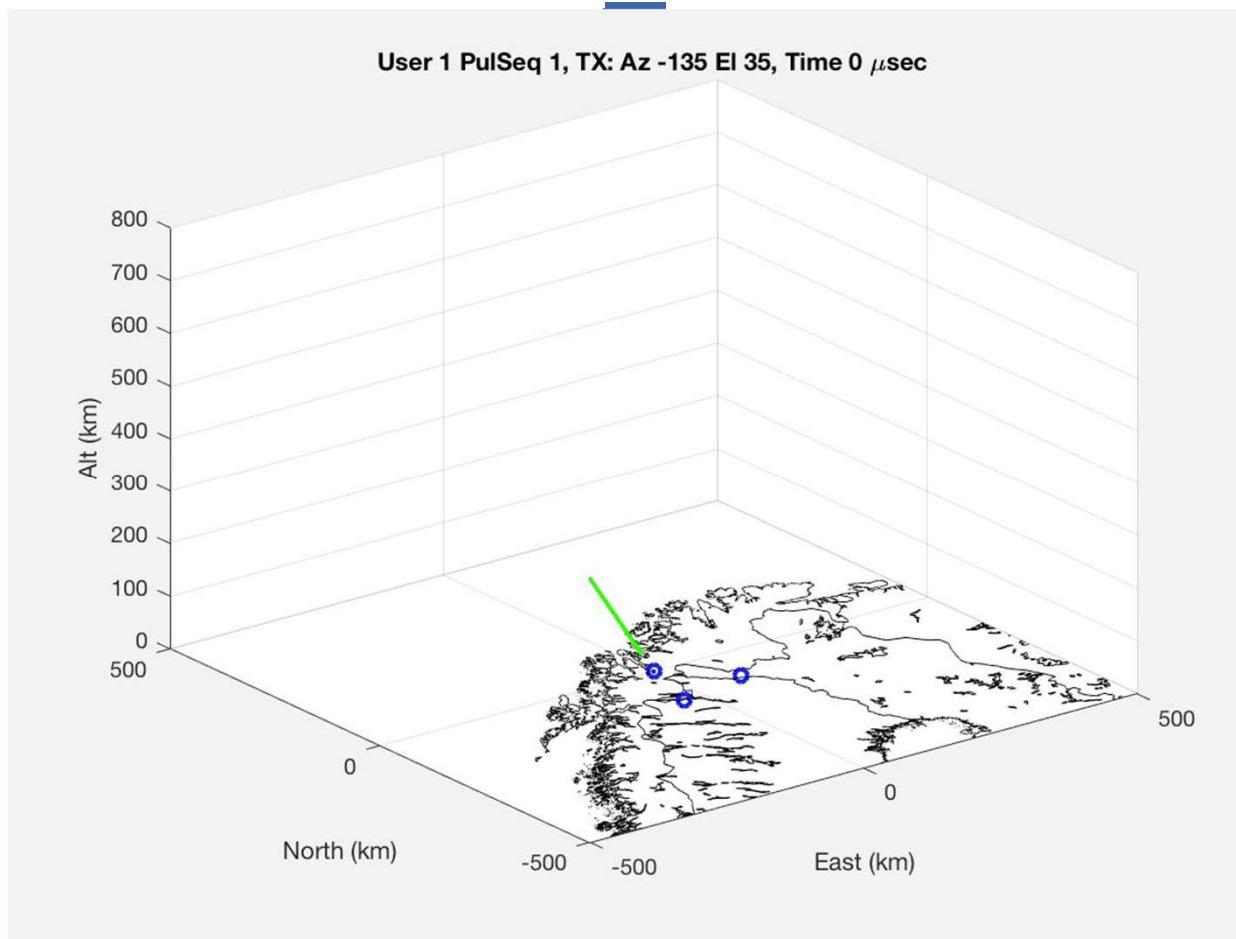


# Stage 1 Locations





# EISCAT\_3D Grid

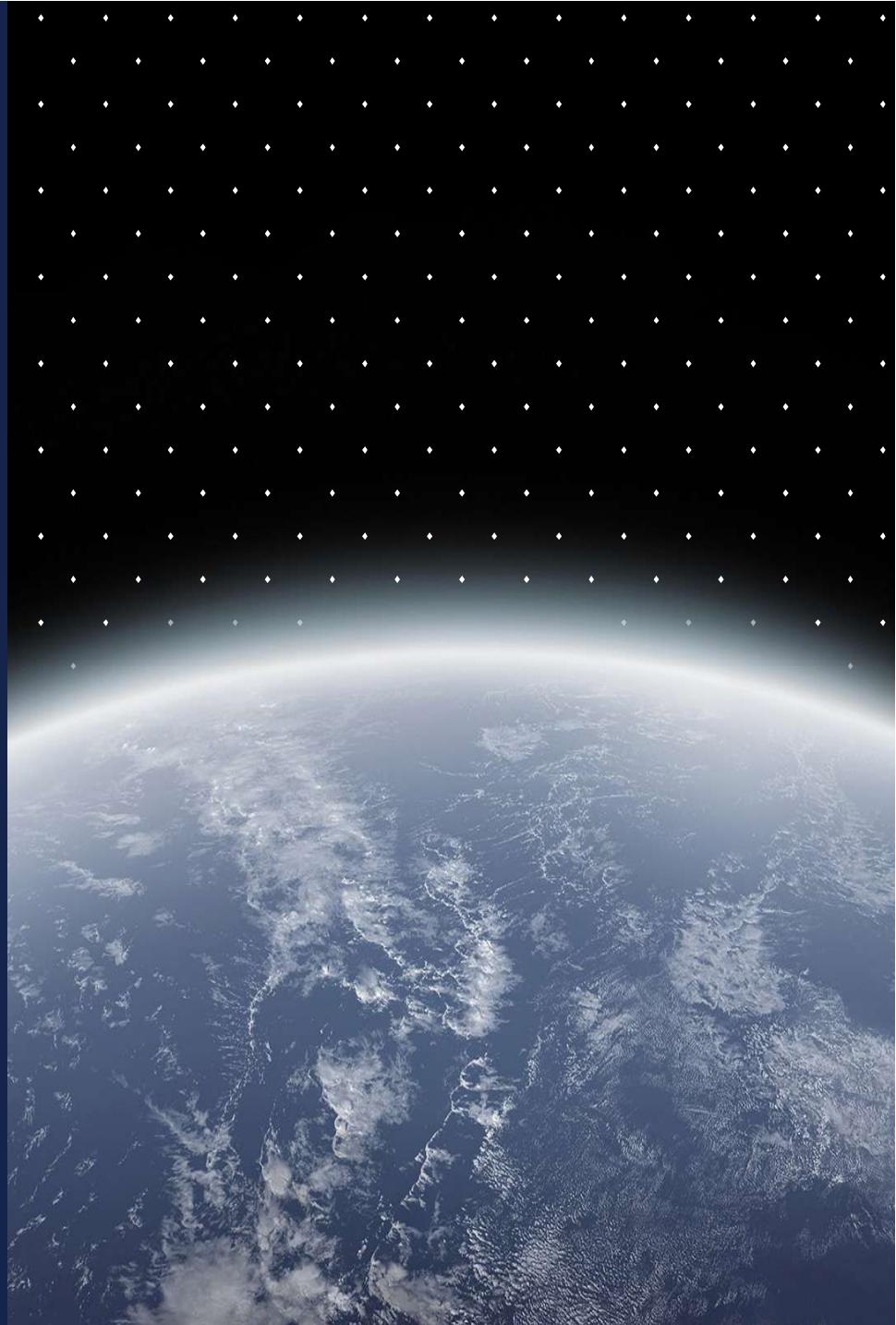




WE HELP  
EARTH BENEFIT  
FROM SPACE

THE FUTURE OF SPACE IN  
NORTHERN SWEDEN

Lennart Poromaa  
2018-08-30





## 2015 Governmental Space Investigation

### Recommendations:

- Esrange should be a strategic asset with focus on international collaboration.
- Esrange should aim to become a leading European Space Center with regards to development, demonstration and testing.
- The region of Kiruna (ESRANGE, IRF, EISCAT, LTU) have unique conditions that should be developed together.



## 2018 Swedish Space Strategy

*..Activities at Esrange will continue to be modernised to serve as a strategic resource for national and international research, development, demonstration, test activities and other space-related activities. The facility also has the potential to develop into a **rocket launch test facility**.*

*..An upgrade and modernisation of Esrange is currently ongoing. The modernisation provides Esrange the possibility to be used as an **international test-bed** for technology development within a broad spectrum of applications that support technology development. Examples of such applications can be **planetary landers** and **reusable rockets**.*

*..The government assigned to the Swedish national space board to, in consultation with SSC, examine the feasibility of **launching small satellites into orbit** ... the issue is currently in preparation at the Government Offices.*



# SSC AND THE SPACE DEVELOPMENT

## 1. Testbed Esrange

For advanced space technology testing.

## 2. SmallSat Express

The European launch facility for small satellites

## 3. Mobile balloon team

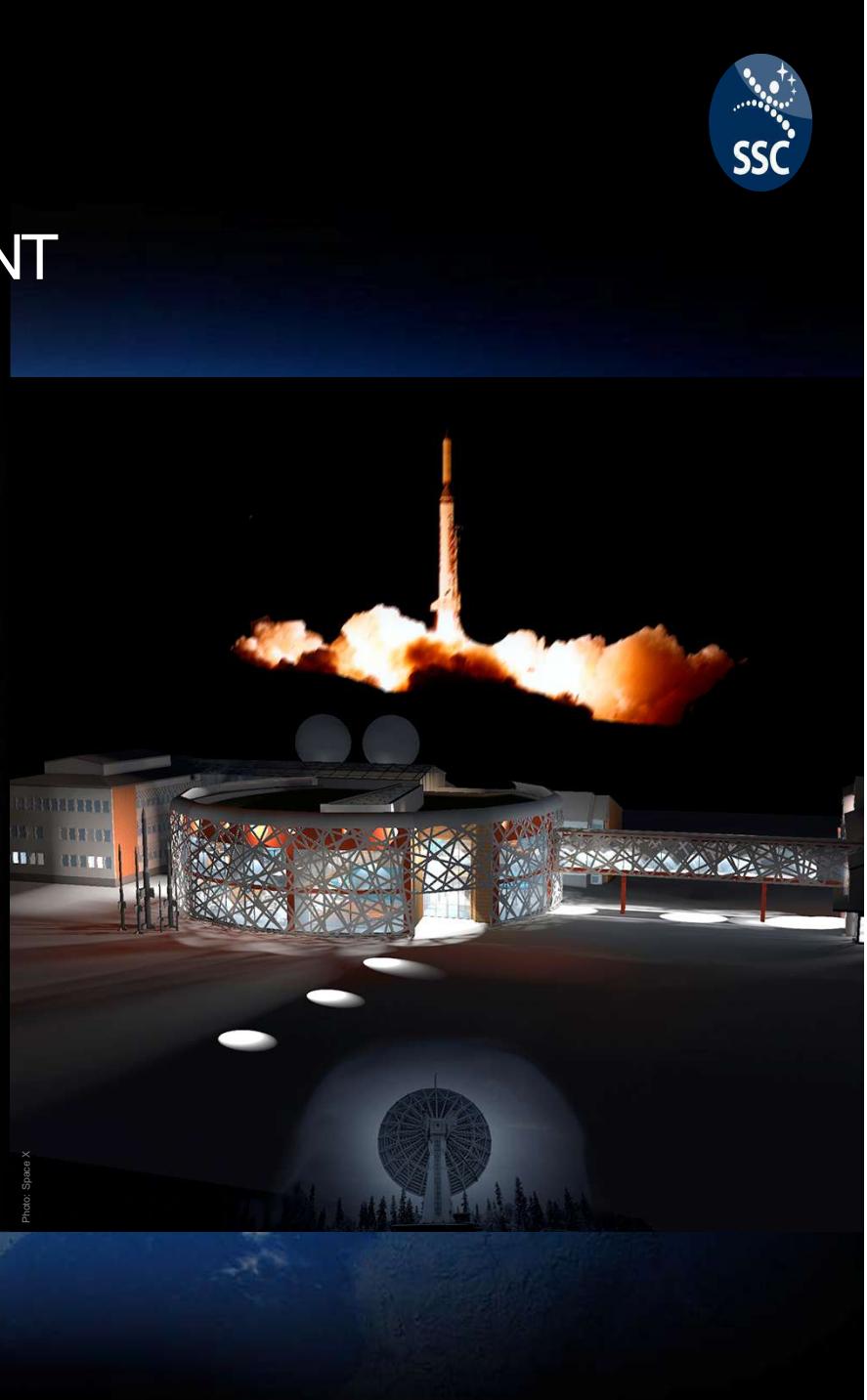
Launch of the largest balloons, from anywhere in the world.

## 4. Global Watch Center

A neutral global focal point of all available EO data.

## 5. Satellite communication services

Optimized for communication with small satellite constellations in low Earth orbits.

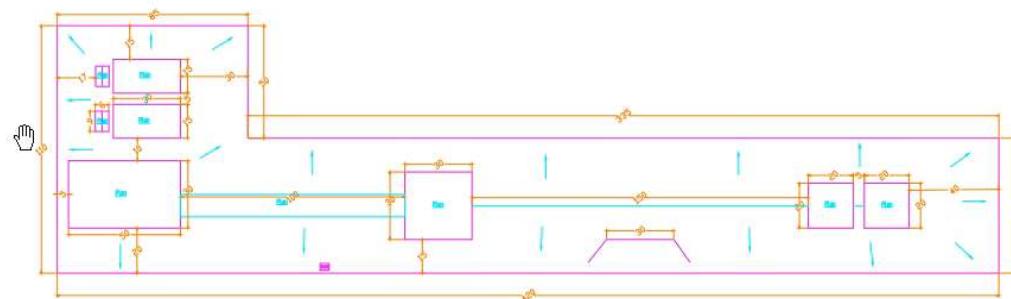


# ESRANGE TESTBED INFRASTRUCTURE



## OVERVIEW

- Board decision taken to invest 20 MSEK – to ensure start of LCE basic establishment
- 60 MSEK from Swedish Government – to further develop testbed infrastructure
- Technical project manager and project manager hired.
- Private land bought and lease signed for road
- Pre-design done
- Building permit filed – and approved (Valid in beginning of September)
- Environmental permit filed
- Archeology permit filed
- Tender process initiated for development – selection Sept 4.
- Build start Sept. 20



# TESTBED ESRANGE

## OVERVIEW



Descent and landing testbed  
for planetary exploration  
missions.

### Unique commercial support services for:

- Engine development and test
- Stage development and test
- Exploration vehicle and system test
- Reusability testing for launchers
- Sounding rocket test launch



# SMALLSAT EXPRESS

## GOAL



We will launch Satellites into orbit from Esrange before the end of 2021.

# THE COMPETITION

## DEDICATED LAUNCHERS EUROPE



### National, ESA and EU backed initiatives

- Norway – Andøya Rocket Range (PHASE B)
- UK – Greenfield – ORBEX and VO (PHASE A/B)
- Scotland – Greenfield – Rocket Labs (PHASE A/B)
- Portugal – Azores former airstrip (PHASE A)
- Sweden – Esrange Space Center (PHASE C)

We are currently ahead – but we need to find our niche and ensure time to market.



Norrbotten will win the microlauncher race.

## Arena Artica

- Flygutprovningar i vintermiljö, Airbus mfl
- Forskningsuppdrag
- Militära aktiviteter





# Centrumbildningen

- Permanent enhet med aerospace fokus – en ingång till hela LTU.
- Verka för gemensamma forskningsprojekt
  - Gemensamma ansökningar, RIT, H2020, NRFP, TVV etc. (PostDoc och doktorandprojekt)
  - Kommande **Rymdforskarskolor**
  - Bevakning av relevanta utlysningar. Grants office.
  - Påverka infrastruktur & laboratorier
- Kompetensförsörjning
  - Examensarbeten
  - Hjälp med **rekrytering**, sommarjobbare, arbetsmarknadsdagar
  - Med i LTUs programråd
  - Projektrelaterade kurser
- Mötesplatser, studiebesök
- Omfattande nätverk & kluster
- Aero space Cluster Sweden



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# Tack för ordet

