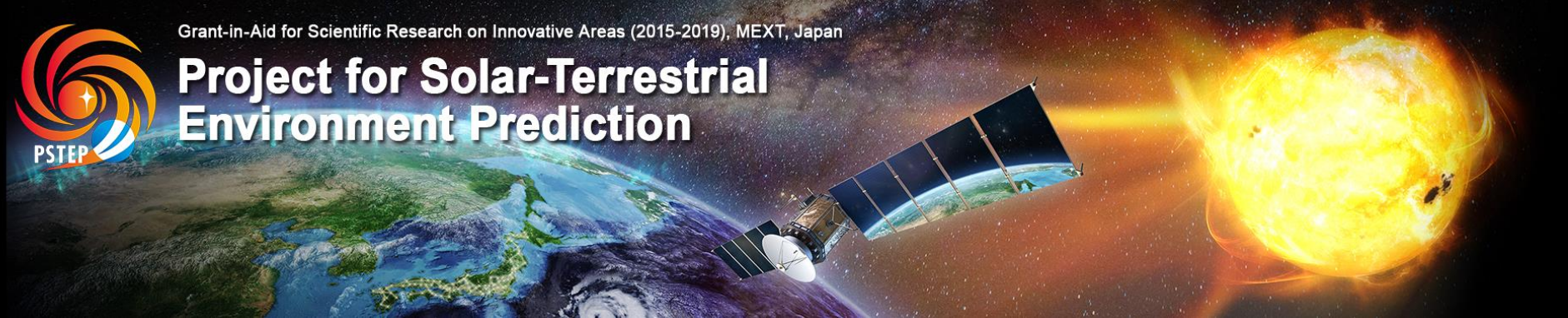




Grant-in-Aid for Scientific Research on Innovative Areas (2015-2019), MEXT, Japan

# Project for Solar-Terrestrial Environment Prediction



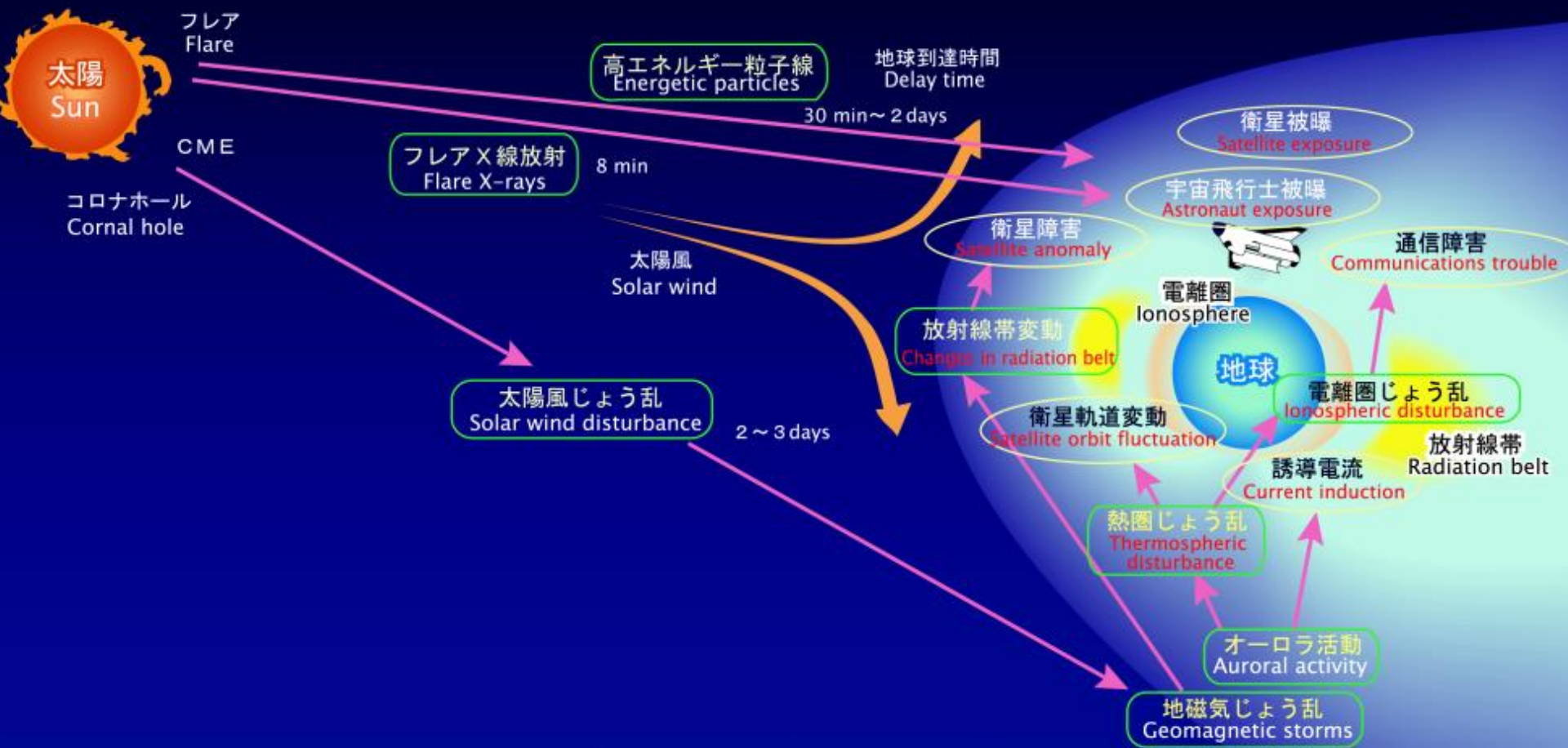
## INTRODUCTION OF RECENT JAPANESE SWX ACTIVITY, PSTEP PROJECT

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Mamoru Ishii

National Institute of Information and  
Communications Technology,  
Japan

# What is "Space Weather"?



Space weather: cause and effect  
 宇宙環境擾乱の発生と障害

# Relation of Needs-Seeds in SWx

Solar Terr. Phys.

SWx the social needs

Sun

IPS

Magnetosphere/Ionosphere influence

Social hazard/needs

Coronal Hall

High speed solar wind

Disturbance of magnetosphere

Satellite anomaly

Hazard to satellite operation

CME/CIR

Plasma cloud

Increase radiatoin

Increase of high energy particle

Human radiation

Hazard to human activity in space

Soalr flare

X-ray

Disturbance ionosphere

Ionization of lower ionosphere

Increase of electron density

Increase of ionospheric

Expanding upper atmosphere

Ground conductivity distribution

Disability of GNSS

Hazard to telecom, broadcast

Hazard to positioning

Academic institutes

Change the satellite orbit

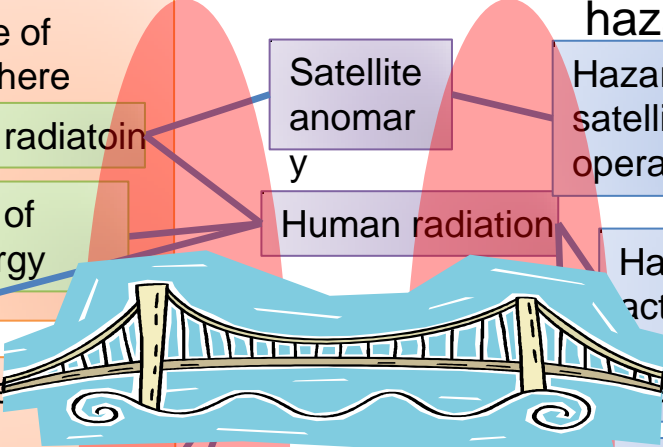
Hazard to power line

society

Study of unknown process

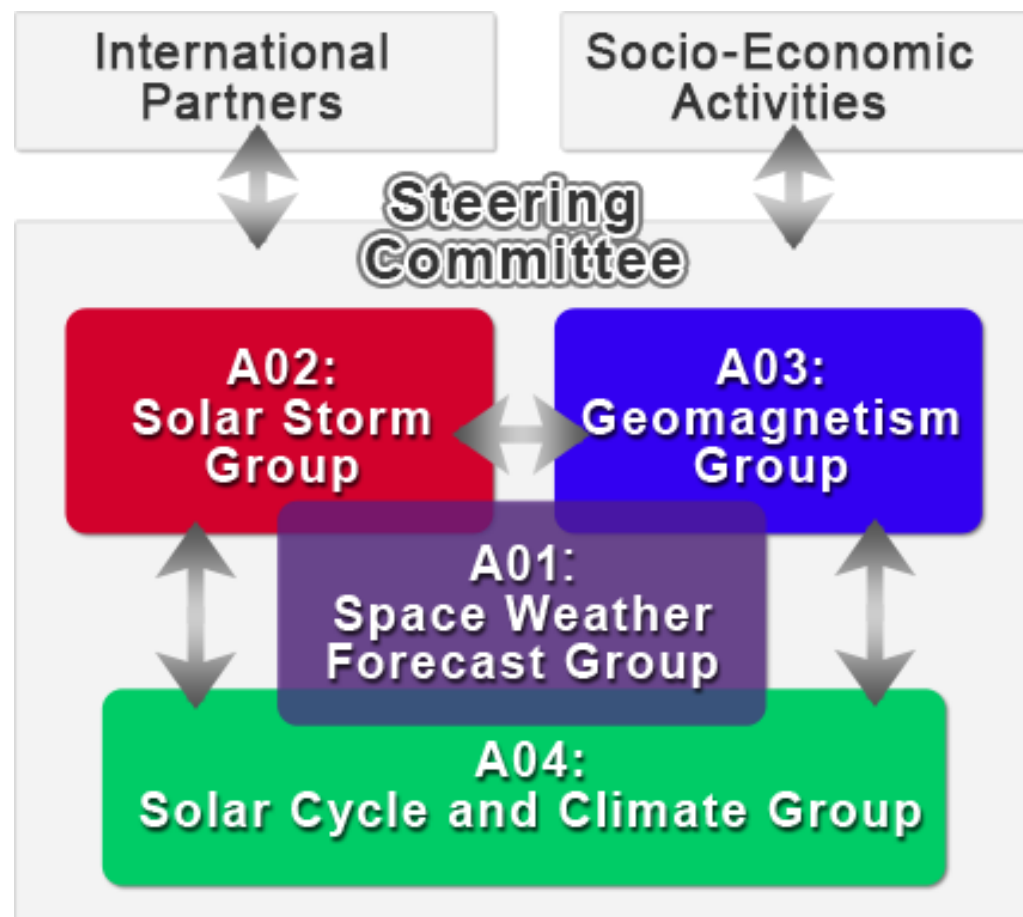
GIC

SWx becomes Indispensable information for their task



# Structure of the project

- There are four working groups in PSTEP
- A01: space weather forecast group
- A02: Solar storm group
- A03: Geomagnetism group
- A04: Solar cycle and climate group



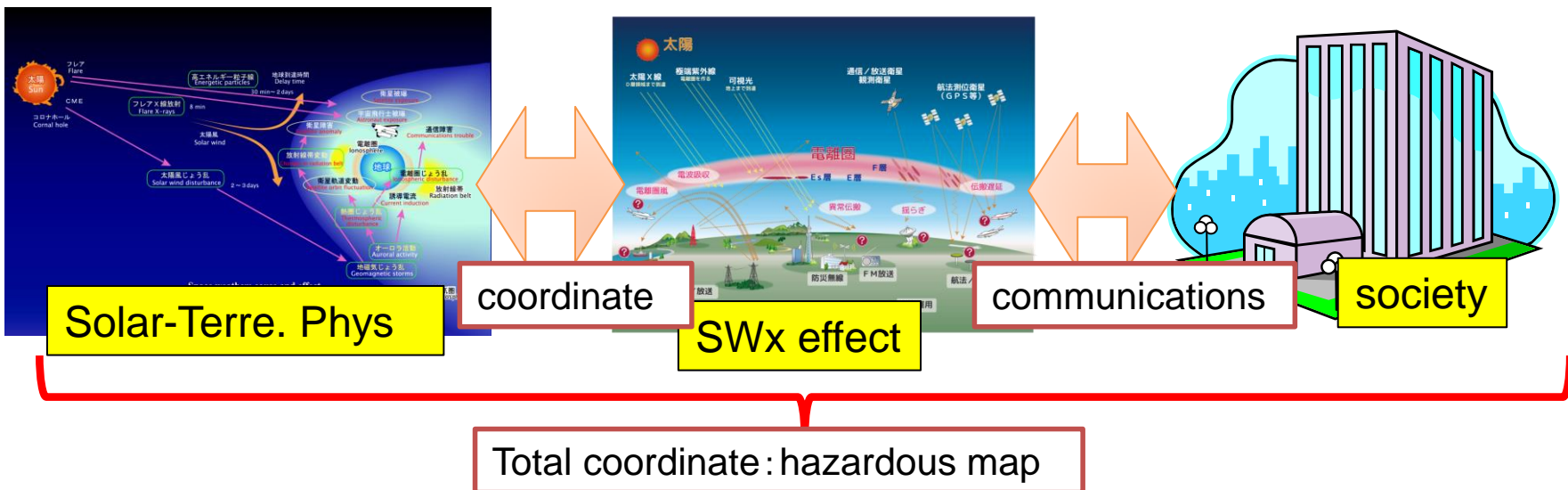
# PSTEO-A01 : next generation space weather forecast

## Issues to be solved

- The effect of SWx to high concentrated ICT society is unknown
- It is necessary to establish an integrated space weather system in the society against significant space weather event in the next solar cycle.
- Most of potential users do not know the importance of SWx.: necessary to communicate to them

## actions

- Build a system to provide a useful information for users
- Identified simulation model among sun/solar wind/magnetosphere/ionosphere
- Establish Japanese original hazardous map to make sure the next solar cycle



# Sub Group in A01

Radio propagatio SG

Satellite Anomary SG

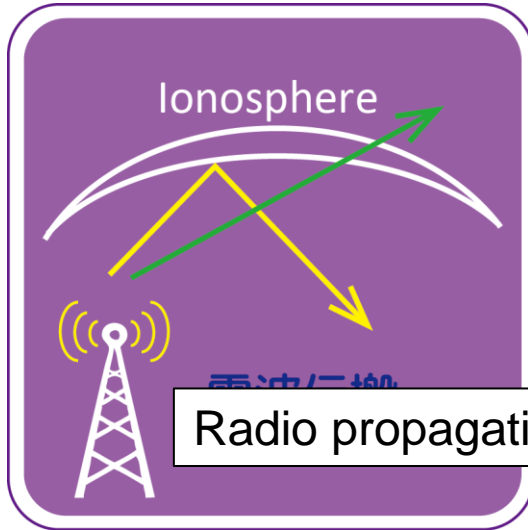
Human radiation SG

GIC SG

Model Integrated SG

Hazardous map SG

# Product to be created



Radio propagation simulator



人体被曝量  
推定システム

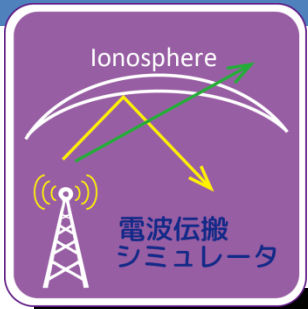
Human radiation  
estimation system



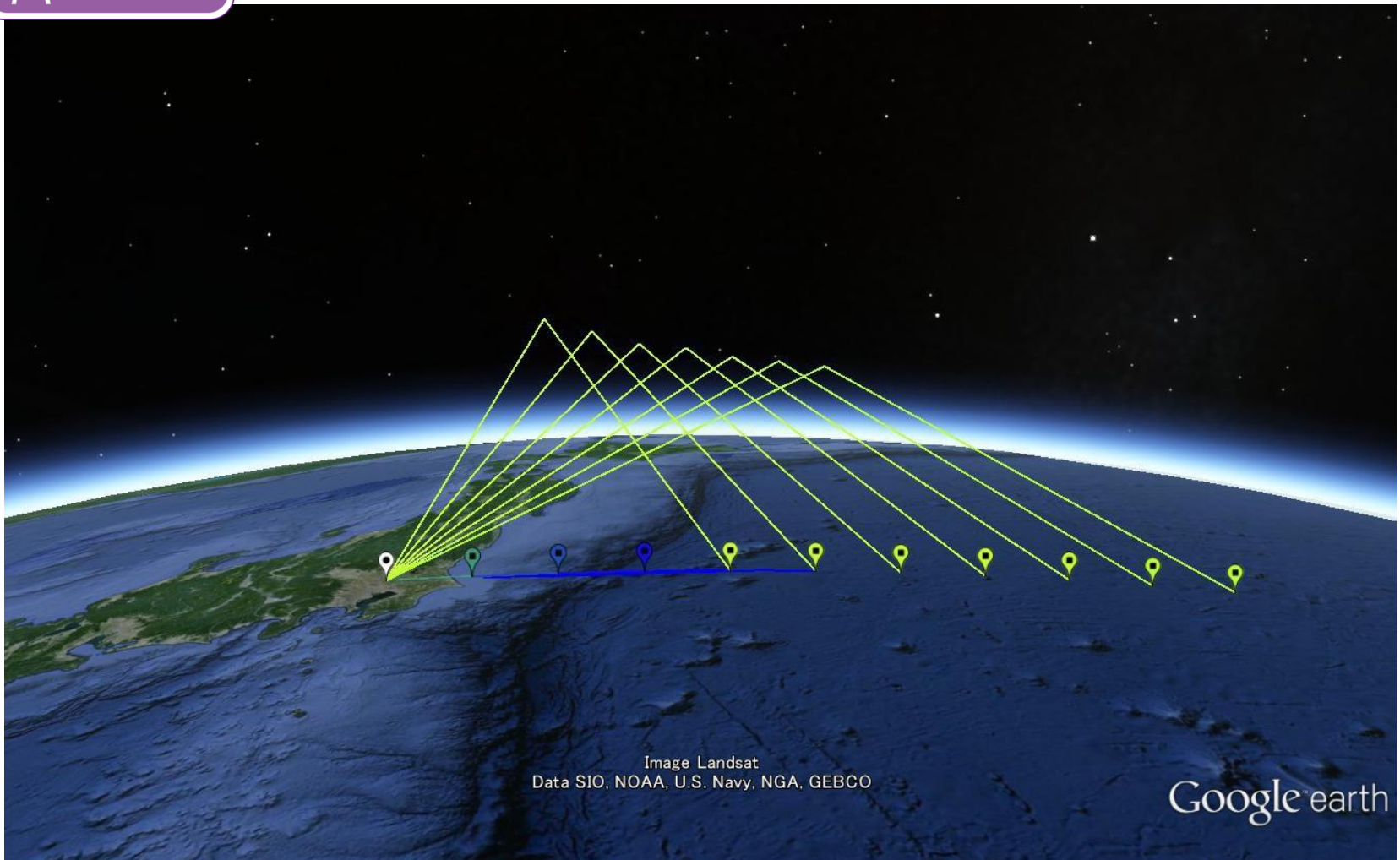
GIC hazardous warning  
system



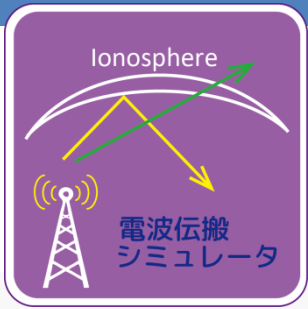
“Taylor-made Space weather” satellite  
Warning system



# Sample of radio propagation simulator

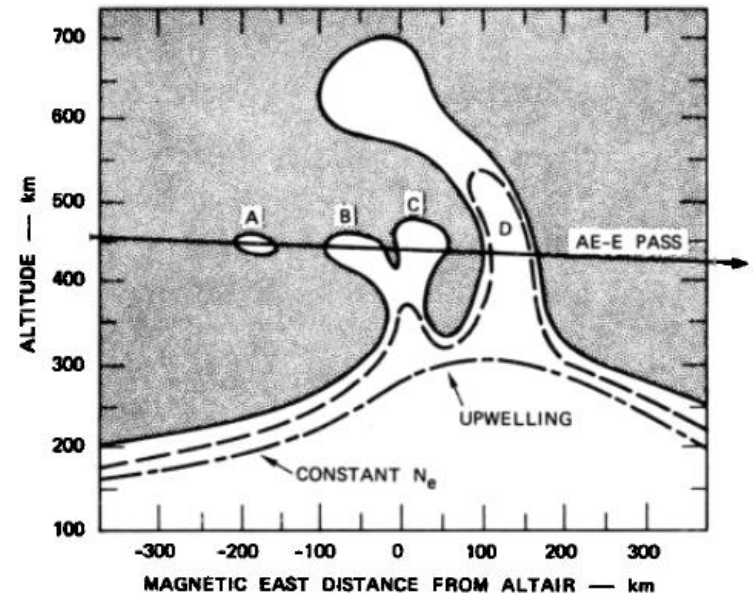
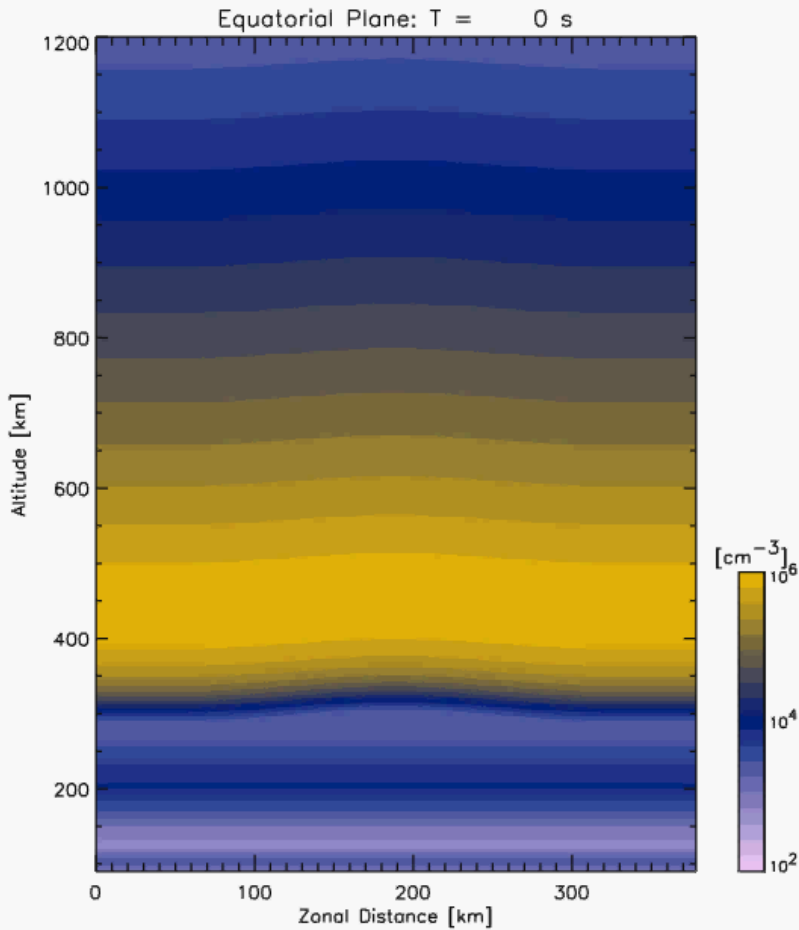
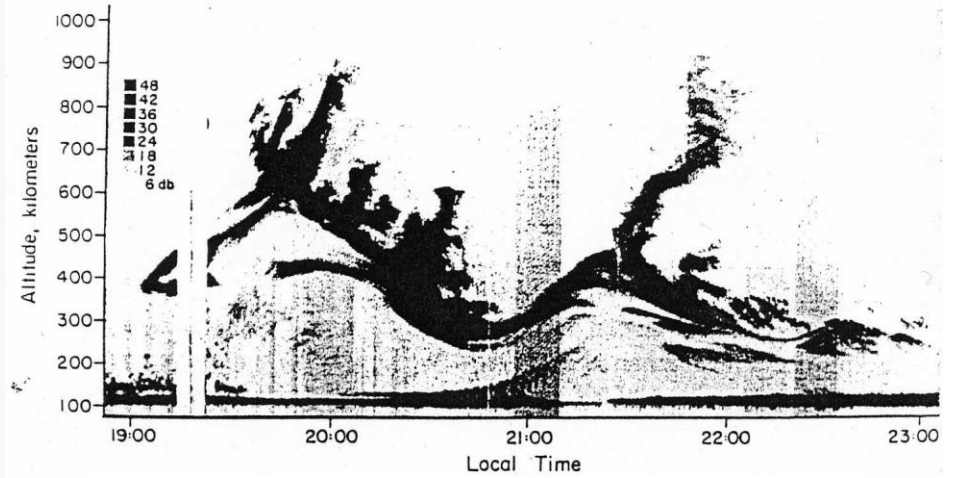


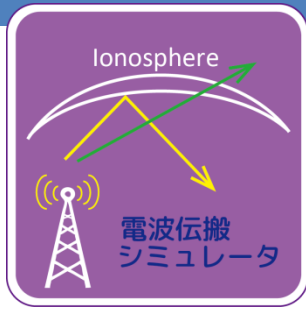




# EPB (Equatorial Plasma Bubble)

Jicamarca Vertical Backscatter at 3 meters  
March 21, 1979





# Purpose of establishing the radio propagation simulator

- Initial purpose
  - Is to estimate the disabled area of HF, VHF and satellite positioning. We discuss the interface of the product with users of GNSS
- Final goal
  - Is to build the forecast system of radio propagation disturbance with ionospheric perturbation using the results of A02~04 groups

