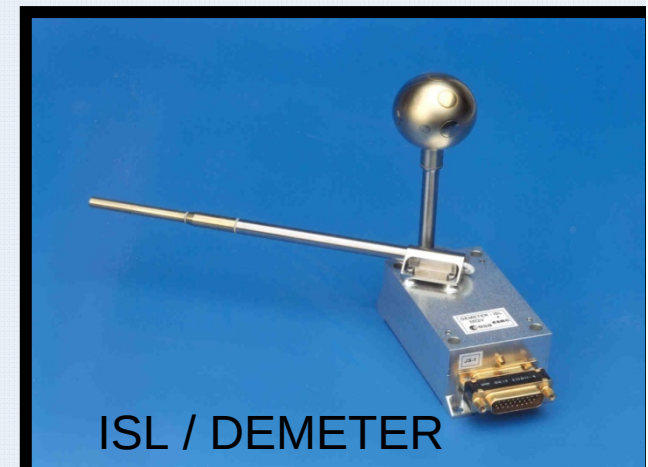
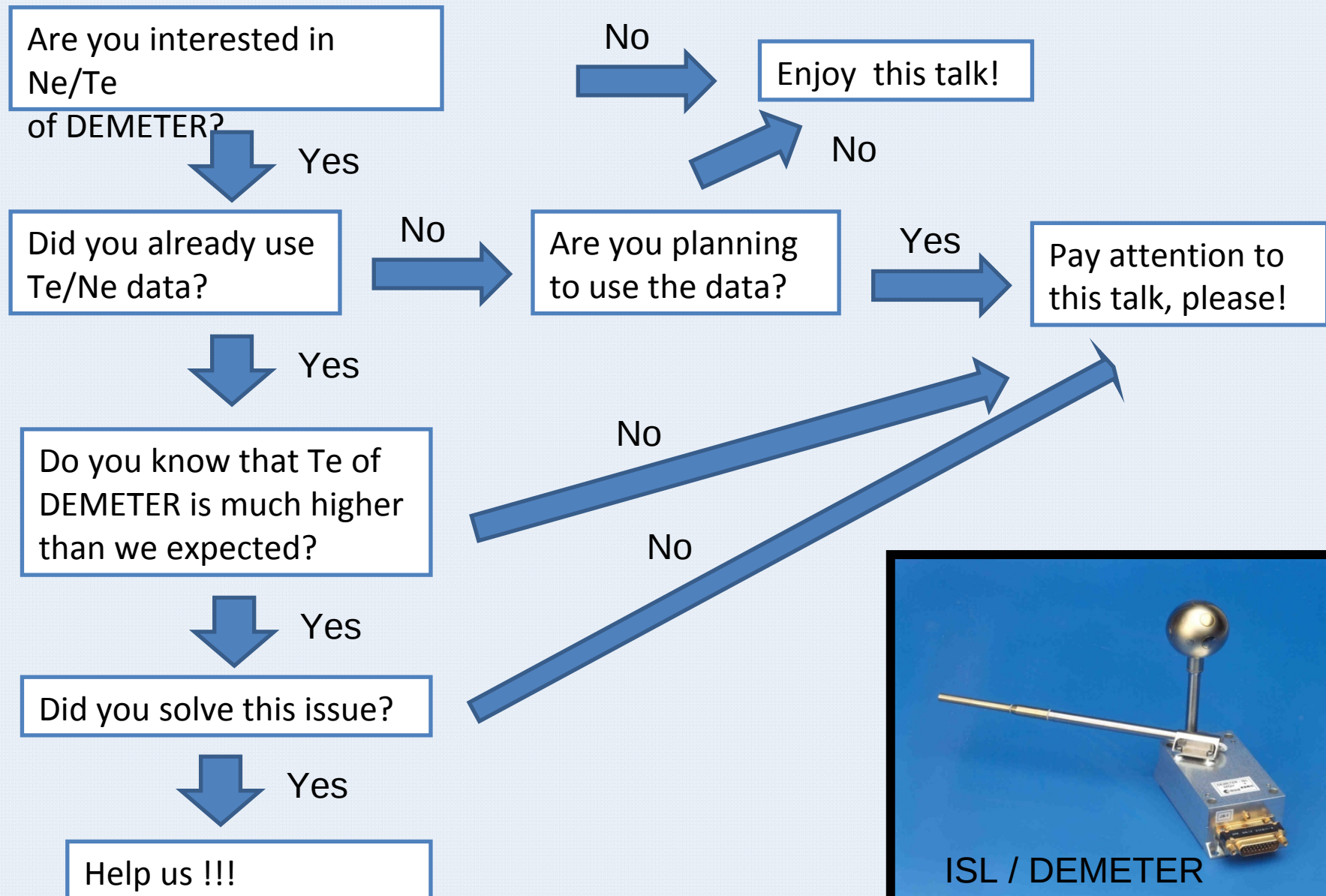


# Validation of electron density and temperature measurement of the DEMETER satellite in comparison with those of various satellites

**M. Kamogawa**, Y. Kakinami, K. Mochizuki, J. J. Berthelier,  
X. Wang, T. Onishi, J. Y. Liu, and T. Kodama

# Question ?



# Our motivation

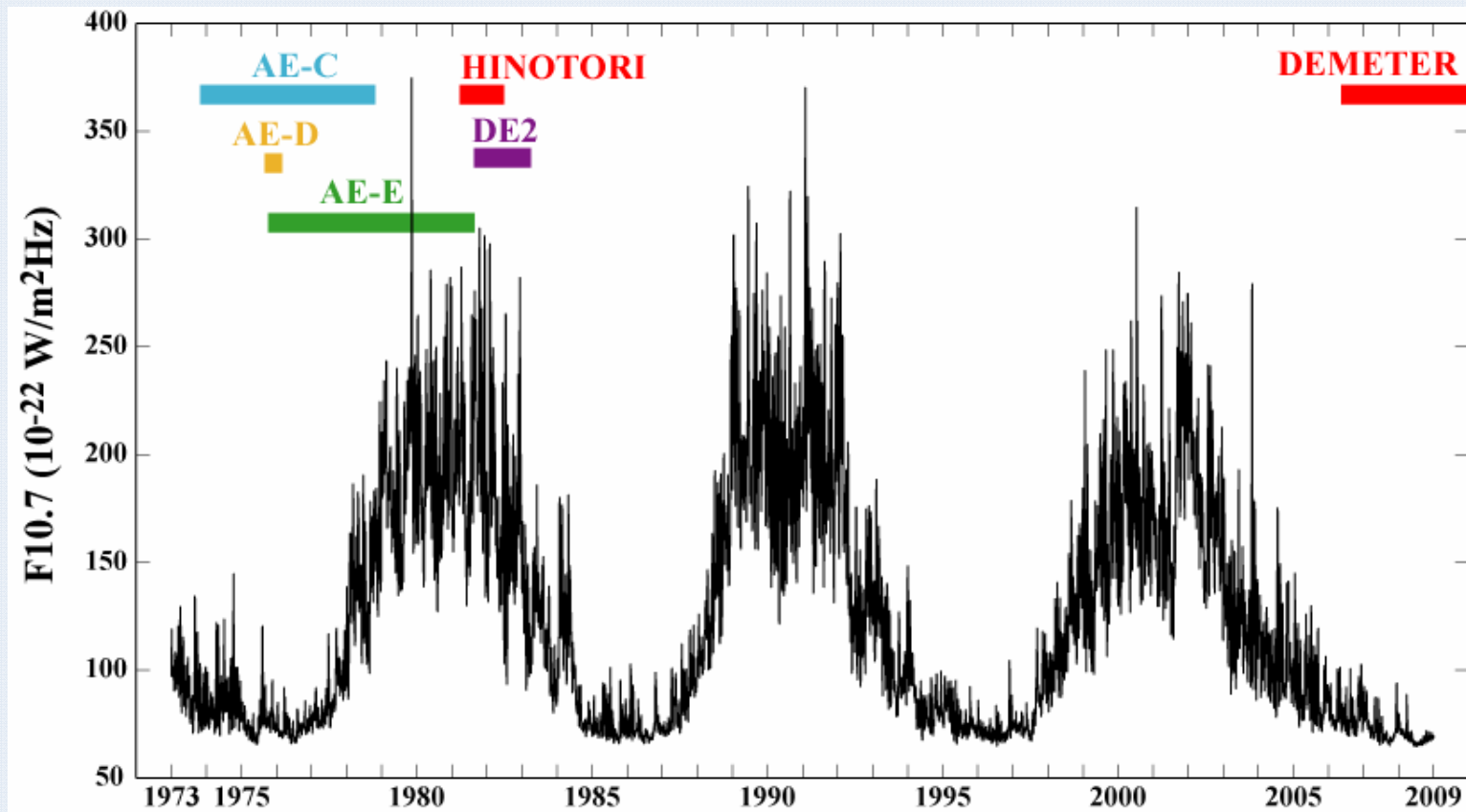
We want to simply know  
whether we can use  
DEMETER Ne/Te data or not.

We compare between Ne/Te  
data of DEMETER and other  
satellites.

## For comparison .....

- Plasma in the ionosphere is produced by the solar Extreme Ultra-Violet (EUV) flux.
- Therefore, Ne and Te are very sensitive to variation of EUV.
- Solar 10 cm radio noise, F10.7 are usually used as index of the solar activity because ...
  - Most of EUV are absorbed in higher atmosphere. So, it is difficult to observe at the ground.
  - F10.7 is correlated to solar EUV

# F10.7 and mission periods of satellites



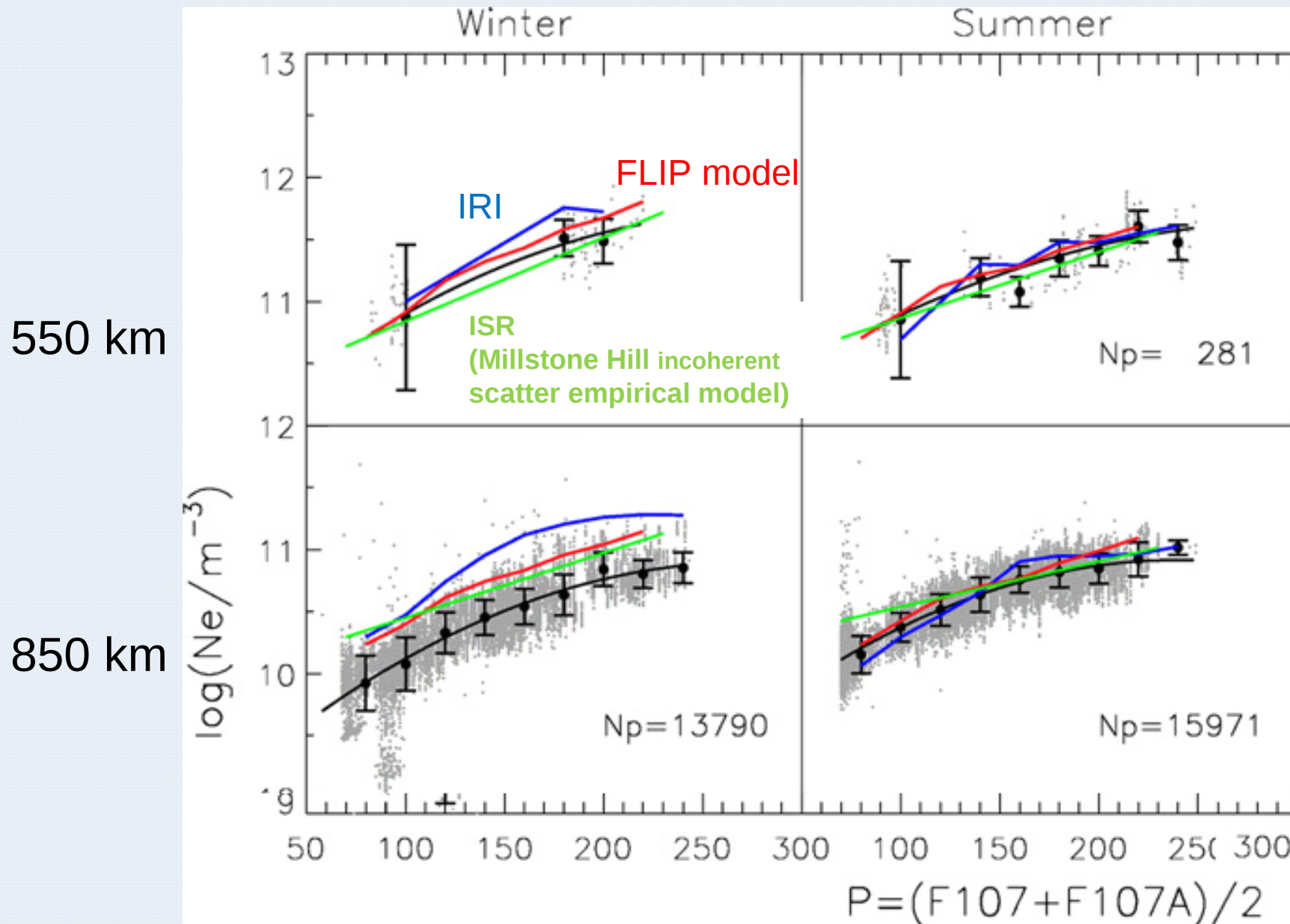
F10.7 variation & mission periods of satellite

# Satellites

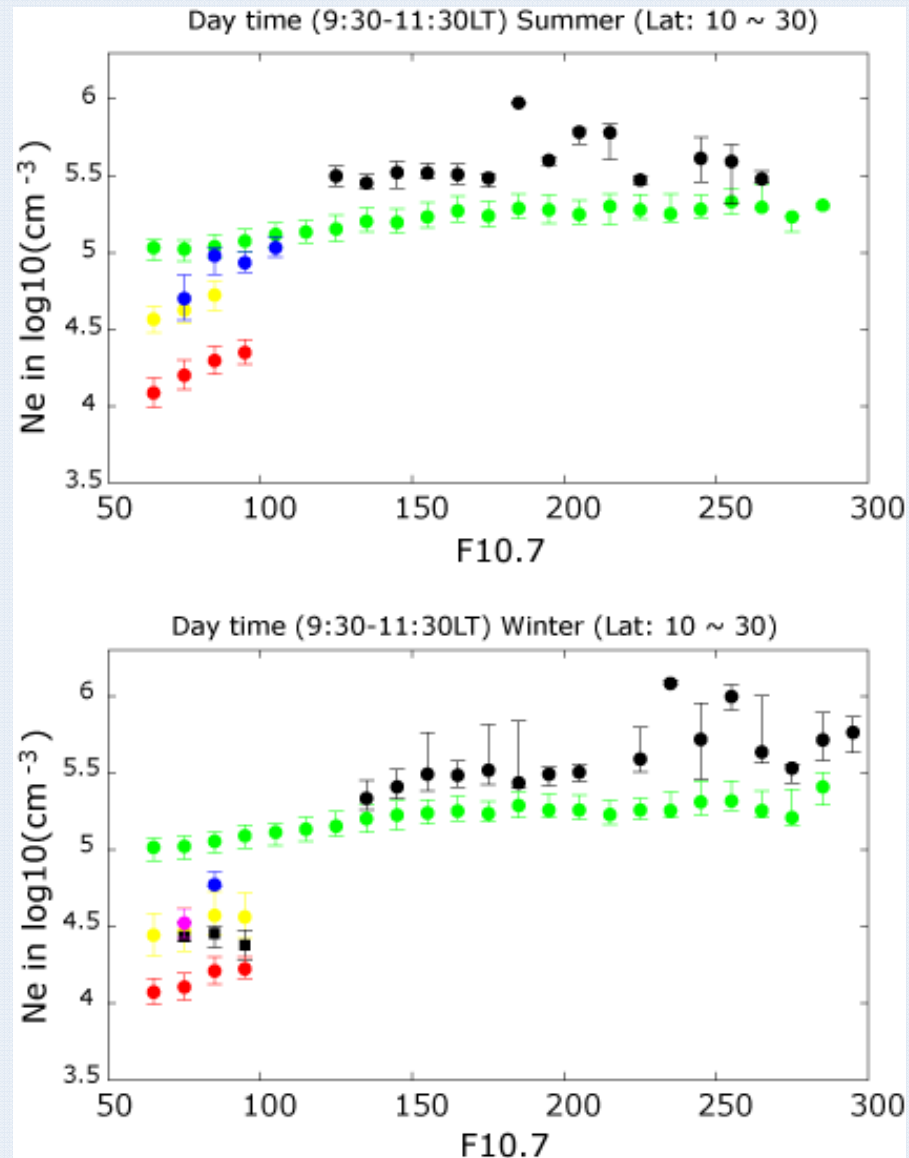
|                  | DEMETER       | HINOTORI                   | DE2            | AE-C                               | AE-D                               | AE-E                               | FORMOSAT-3<br>/COSMIC    |
|------------------|---------------|----------------------------|----------------|------------------------------------|------------------------------------|------------------------------------|--------------------------|
| Period           | 2004<br>~2010 | 1981<br>~ 1982             | 1981<br>~ 1983 | 1973<br>~ 1978                     | 1975<br>~1976                      | 1975<br>~1981                      | 2006~                    |
| Altitude<br>(km) | ~710          | ~600                       | 195~1020       | 128~4313                           | 140~3737                           | 134~2447                           | 600~800                  |
| Te               | Langmuir      | Resonance<br>rectification | Langmuir       | CEP                                | CEP                                | CEP                                |                          |
| Ne               | Langmuir      | Impedance                  | Langmuir       | Retarding<br>Potential<br>Analyzer | Retarding<br>Potential<br>Analyzer | Retarding<br>Potential<br>Analyzer | GPS radio<br>Occultation |

# Recent Improved Empirical Ne Model (Day time: 10-14LT)

Bilitza et al. (2007)



# Ne (day time)



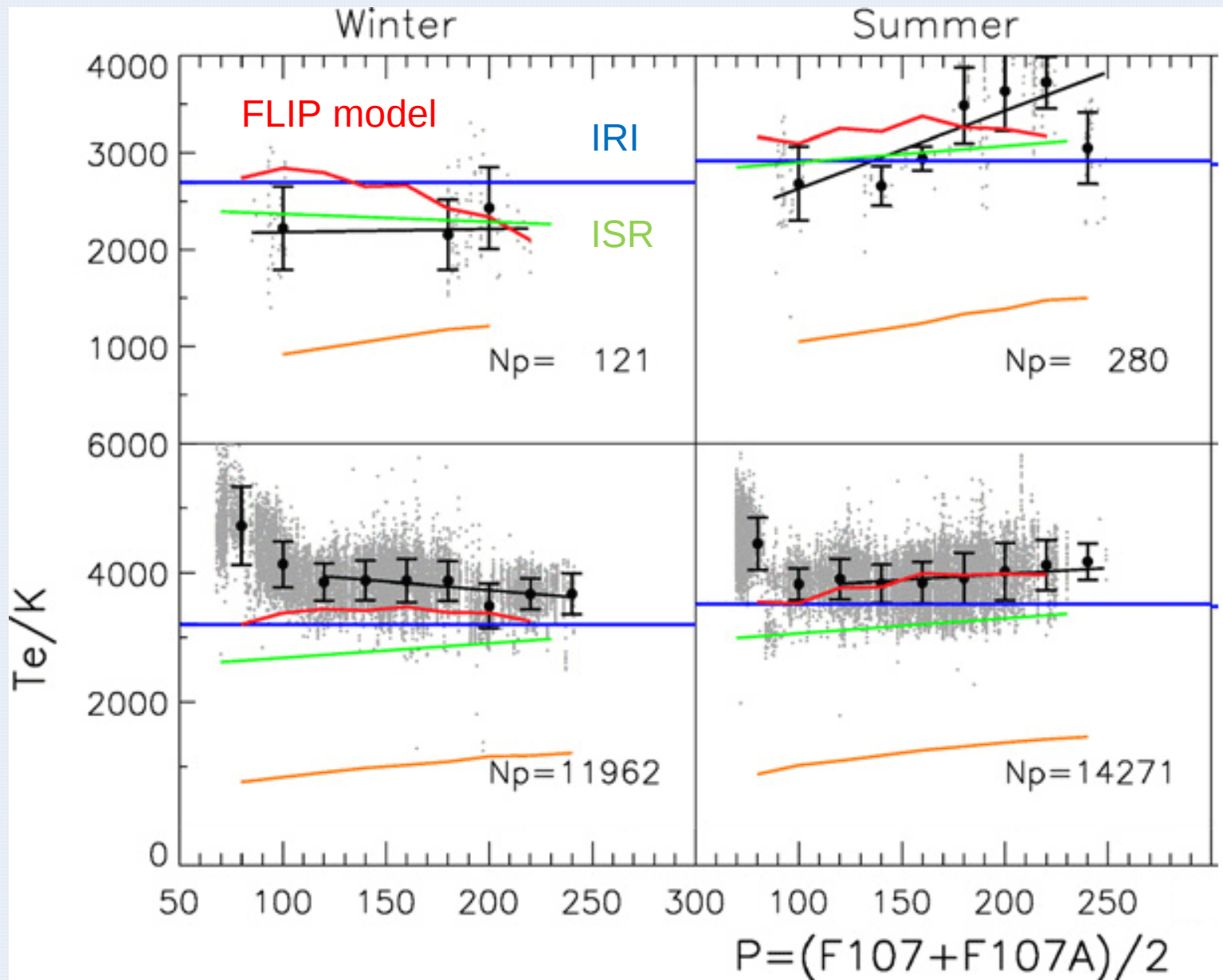
IRI, DEMETER, DE2, AEC, AED, Hinotori, FORMOSAT3

# Recent Improved Empirical Te Model (Day time: 10-14LT)

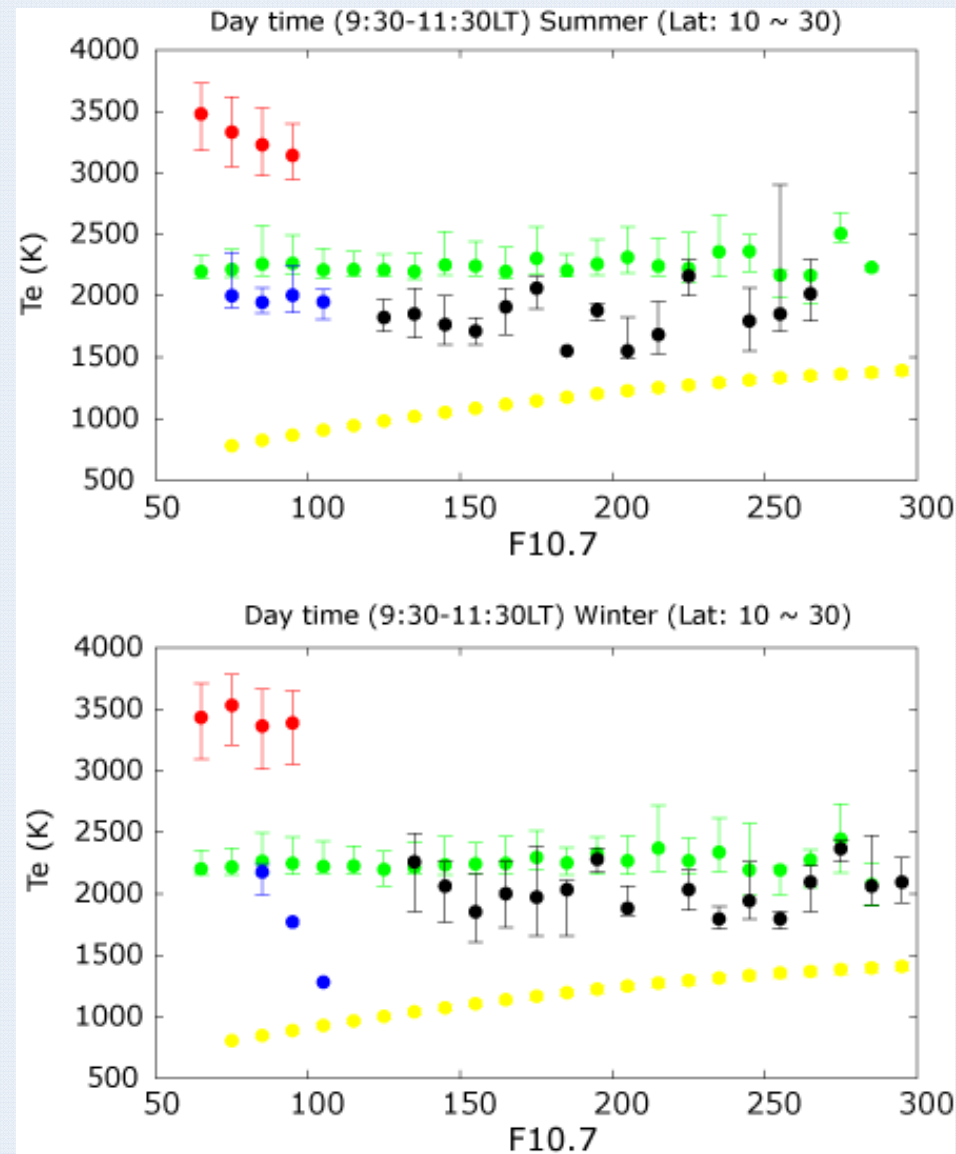
Bilitza et al. (2007)

550 km

850 km



# Te (day time)



IRI, DEMETER, AEC, Hinotori, MSIS-model

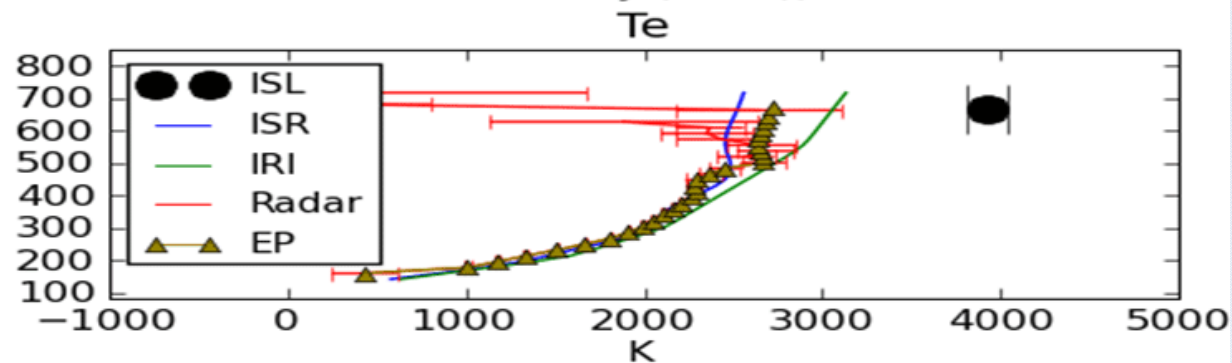
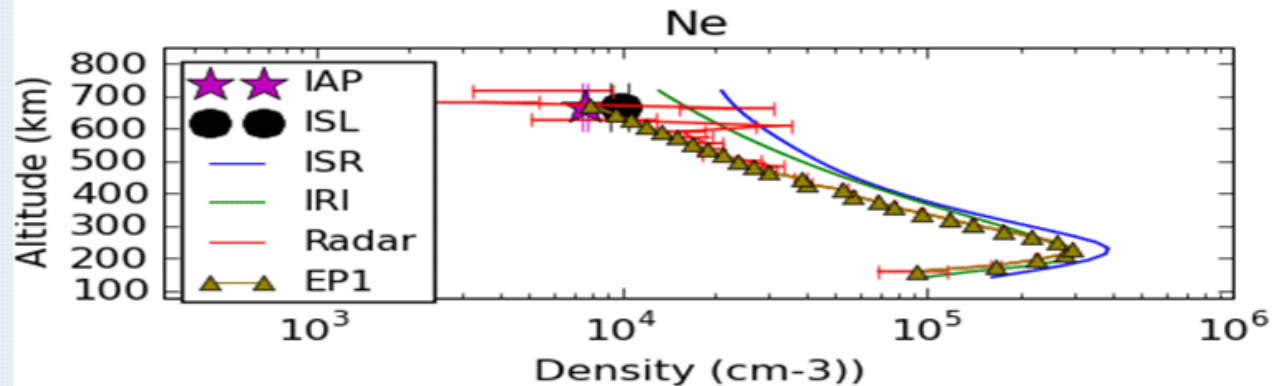
Alternative comparison:

Ground-based incoherent scatter  
radar (Millstone Hill) and ISL

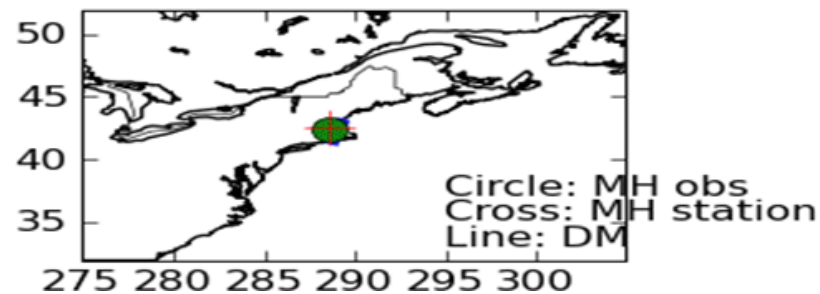
See poster presented by Dr. Jean-  
Jacques Berthelier.

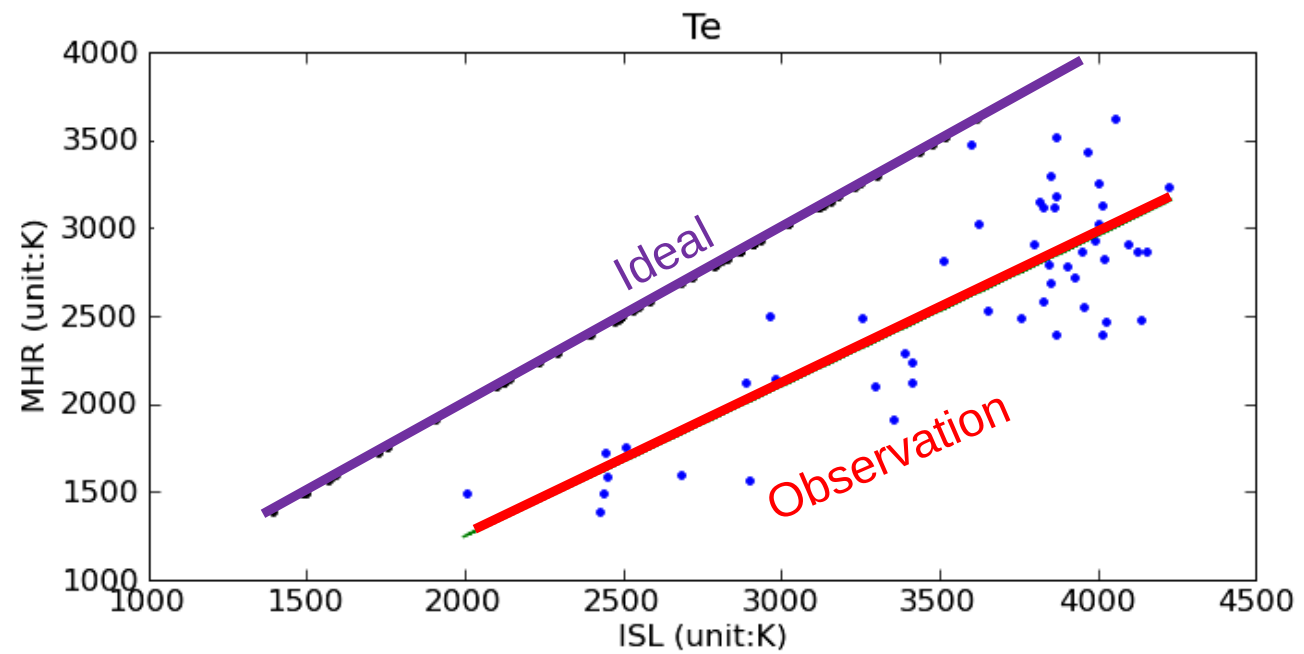
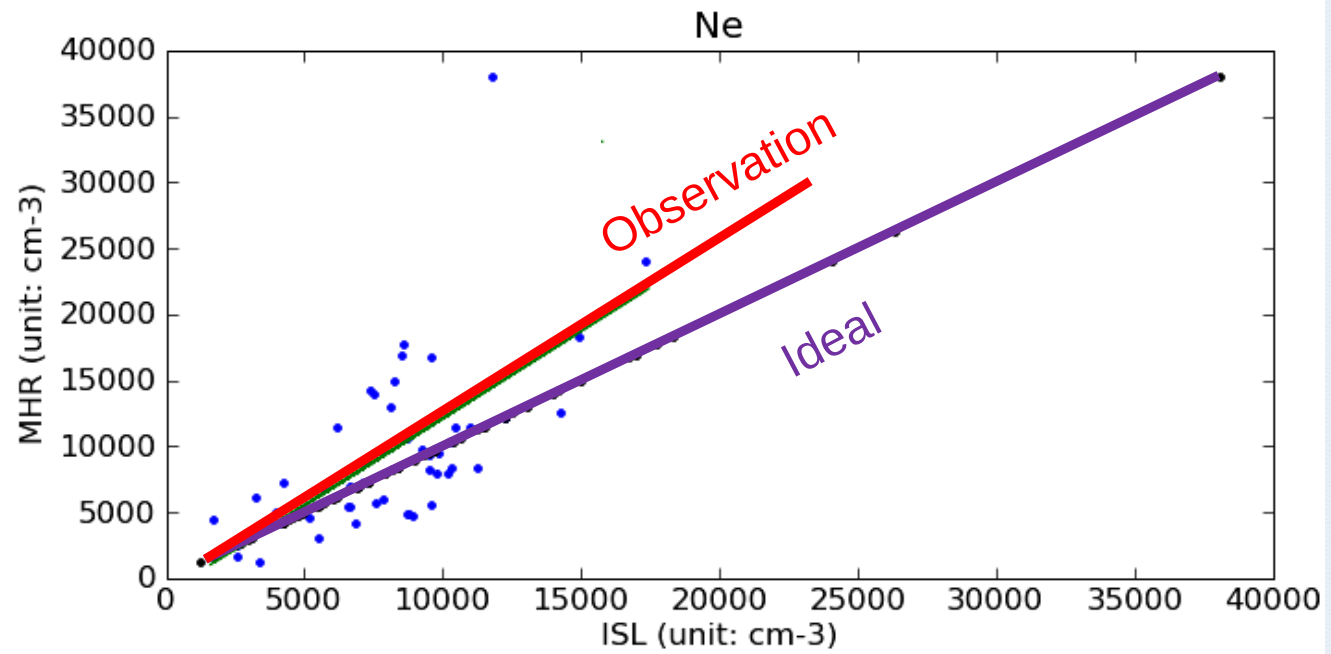
# Comparison between ground-based radar and ISL

Orbit 189950 on 20080121 UT 15.231



The traces of DEMETER near MH





# Concluding remarks

- Te of DEMETER is larger roughly by 900 [K] than absolute Te values.  
---This may be due to probe contamination.
- Ne is slightly small.
- So far, **relative** values of **Te** and **Ne** seems **acceptable** when the remarkable phenomena is are discussed.  
--- Wave four longitudinal structure, Solar eclipse and so on.
- Wait for modified ISL data newly calibrated by Drs. Jean-Jacques Berthelier and J. P. Leberton.



# International Reference Ionosphere (IRI)

- IRI has been developed since 1980
- IRI has been mainly constructed ground-based observation
- Current version (IRI2007) does not have a option to reproduce the solar activity variation
  - The option for the solar activity variation will be innovated into next version
- Therefore, as shown later analyses,  $T_e$  in upper ionosphere reproduced by IRI are almost constant