JEM-GLIMS mission
# (Global Lightning and Sprite Measurement on JEM)

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Motivation and backgrounds

TLEs (Transient Luminous Events)

• High altitude transient luminous events associated with lightning were discovered in 1990's.
• Sprites are believed to be associated with giant lightning which have large discharge currents.
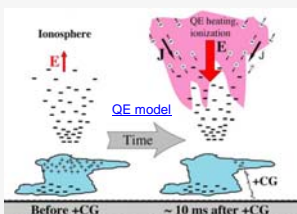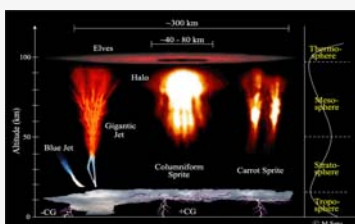

Runaway breakdown model that the breakdown is caused by the quasi-static electric field associated with lightning

【Problems】

(a) Sprites can be caused by the lightning which has the charge moment less than a few hundred ckm

(b) Sprites are not always coincident with the cloud to ground lightning. The spatial difference reported so far is maximum 50 km.

(c) Sprites take place from several ms to hundreds ms just after the occurence of cloud to ground lightning.

(d) The QE model cannot explain the horizontal structure of sprites such as column or carrot type, and also multiple column type sprites.

Gamma emission observed by the CGRO/BATSE, RHESSI satellites
High occurrence (1 event/2 day)
Are these from lightning ?
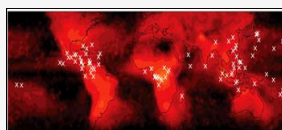
Smith et al. [2005]

• Which lightning process produce gamma emission?
• Is there any connections to TLE?

Needs for the simultaneous observation with lightning

Mission objectives
(1) To observe lightning and Transient Luminous Event(TLE) on a global basis
(2) To observe horizontal structure of TLE and its associated lightning at nadir
(3) To characterize the relationship between TLE/lightning and gamma emissions

Mission sensors
(1) CMOS cameras at 740-830nm and at 762 nm
(2) Photometers at six different wavelength
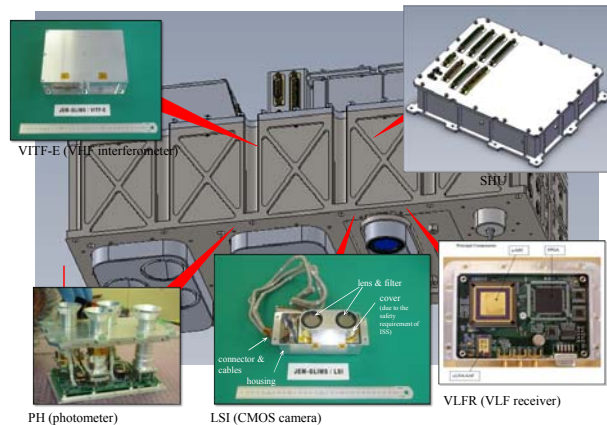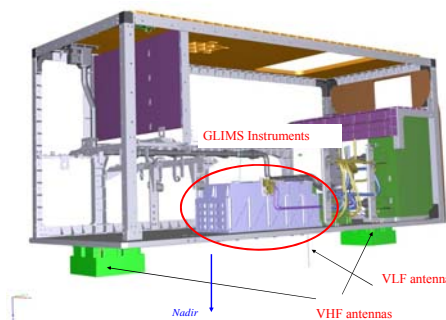(3) VHF interferometer from 70 to 100 MHz
(4) VLF receiver from 1 to 40 kHz
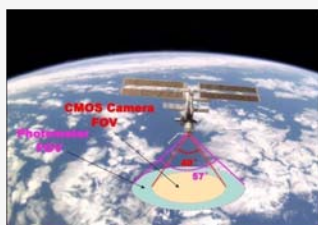
Port-sharing experiment module   *GLIMS* JEM-EF   JEM

Sensors

In this mission, four sensors which observe lightning and sprite are installed on the bottom part of the module. The four sensors consists of CMOS camera at two different wavelength, Photometers at six channels, VLF receiver, and the VHF digital interferometer.

Name	ID	Specification	
CMOS camera	LSI	2 CMOS cameras 512x512 pixels, FOV=28.3 x28.3, fps = 29, 116, 464 (selectable), res.=10 bit LSI-1: = 762+/-5 nm, LSI-2: =740-830 nm	
Photometer	PH	6 photometers λ = 150-280 nm, 316+/-5 nm, 337+/-5 nm λ = 392+/-5 nm, 762+/-5 nm, 600-900 nm fs = 20 kHz, FOV=43, 12 bit	
VLF receiver	VLFR	1 set of VLF receiver f = 1-40 kHz, fs = 100 kHz, 13 bit, monopole antenna	
VHF interferometer	VITF	2 sets of VHF receivers f = 70-100 MHz, 8 bit, patch-type antenna base line = 1.5 m	
Science instrument Handling Unit	SHU	Power ON/OFF control, trigger, data acquisition, data compression, TLM/CMD	

MCE (Multi-mission Consolidated Equipment)

GLIMS Instruments
VLF antenna
Nadir
VHF antennas

VITF-E (VHF interferometer)
SHU
lens & filter
cover (due to the safety requirement of ISS)
connector & cables housing
JEM-GLIMS / LSI
PH (photometer)   LSI (CMOS camera)   VLFR (VLF receiver)

Schedule