

# UTJECAJ SUNČEVE AKTIVNOSTI NA ZEMLJU

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*Opservatorij Hvar*

*Geodetski fakultet Sveučilišta u Zagrebu*



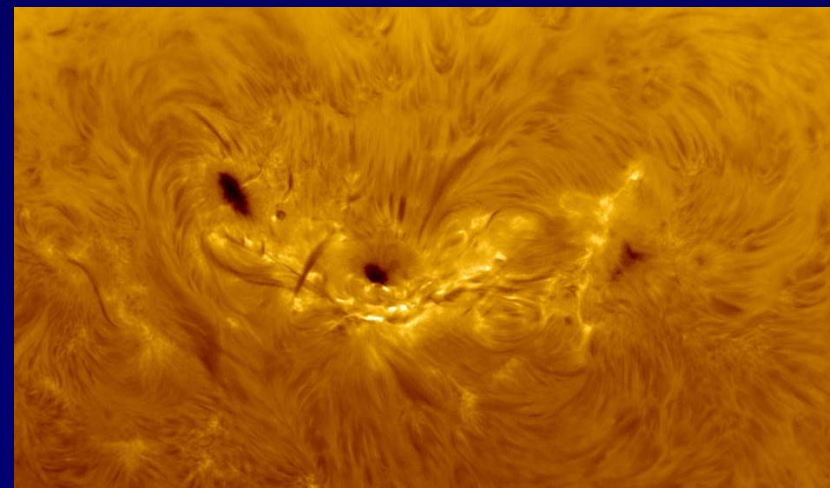
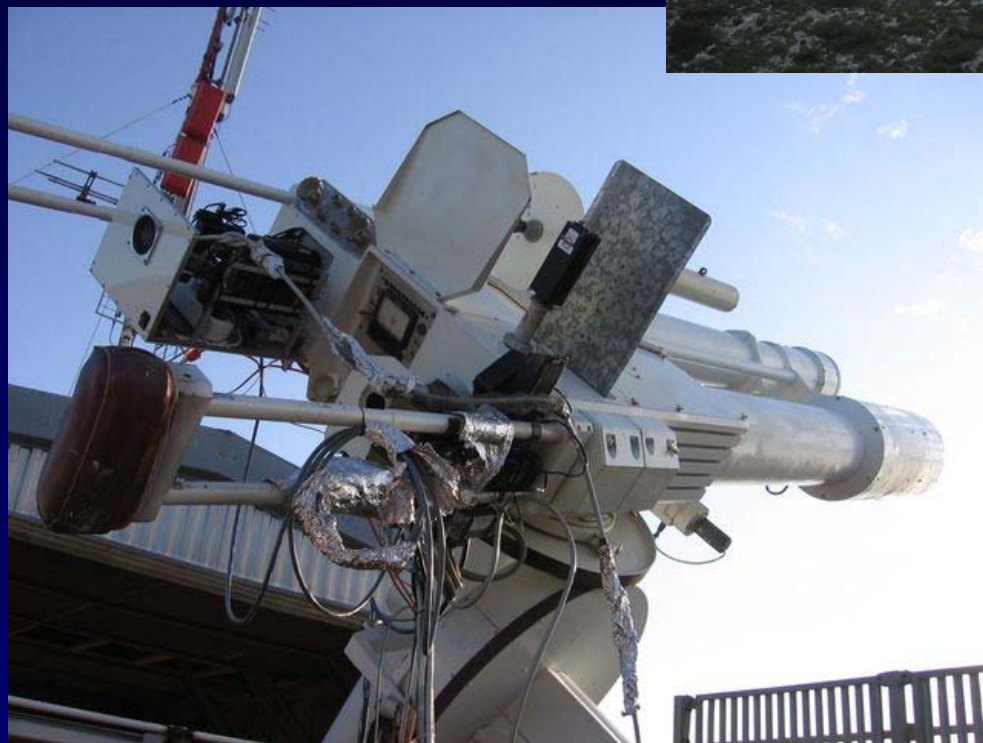
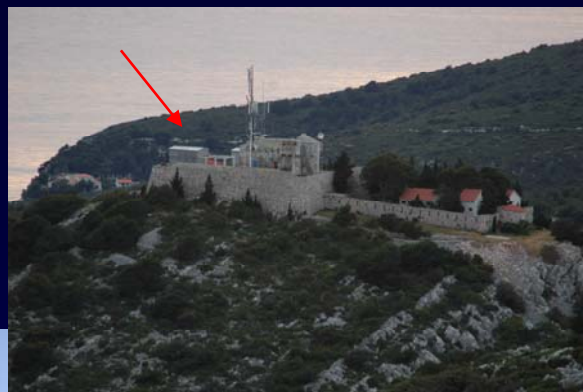
HRZZ-IP-11-2013 6212-SOLSTEL  
“Solar and Stellar Variability”



# Opservatorij Hvar / Geodetski fakultet

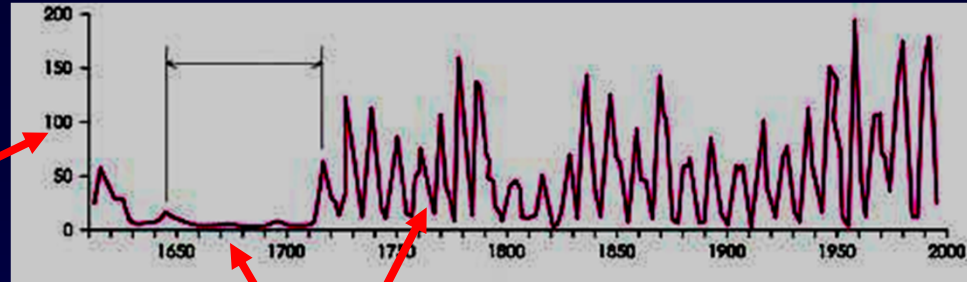


# Hvarski solarni teleskop



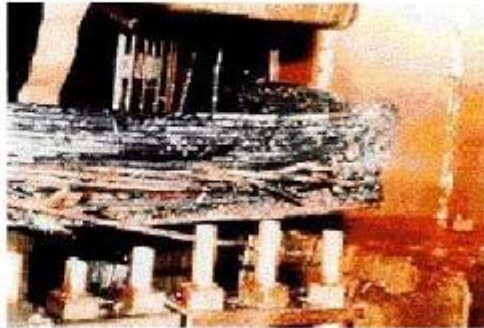
# Malo povijesti

- Rudolf Wolf (1848, “Wolfov broj”)
- Heinrich Schwabe (1843, 11-god. Sunčev ciklus)
- Edward Sabine (1852, geomagnetski poremećaji, aurora)
- Richard Carrington (1859, “Carrington/Hodges event”)
- Annie+Walter Maunder (1894, “Maunderov minimum” ~1645-1715)
- Christian Birkeland (1908, globalne “Birkelandove struje”, aurora, Sunce-Zemlja, Sunčev vjetar)
- II. svjetski rat
- 1950 “Space Weather”
- 1957 (“International Geophysical Year”, IGY)
- Quebec 1998

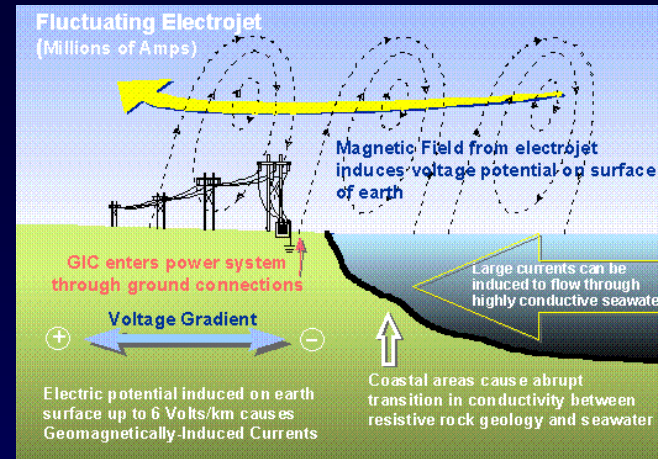




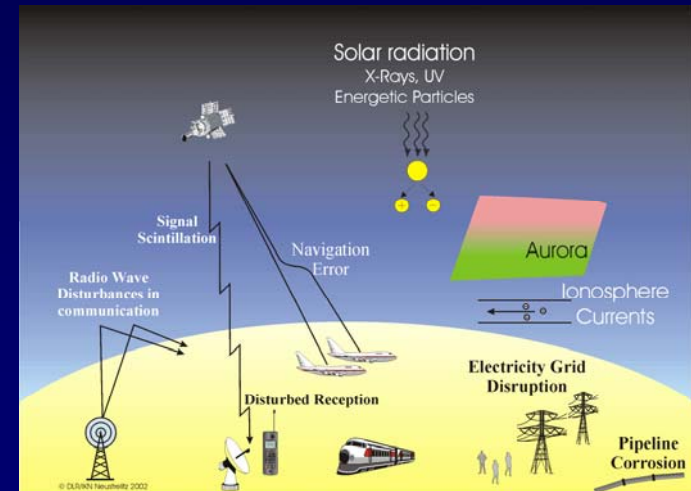
**PJM Public Service  
Step Up Transformer**  
Severe internal damage caused by  
the space storm of 13 March, 1989



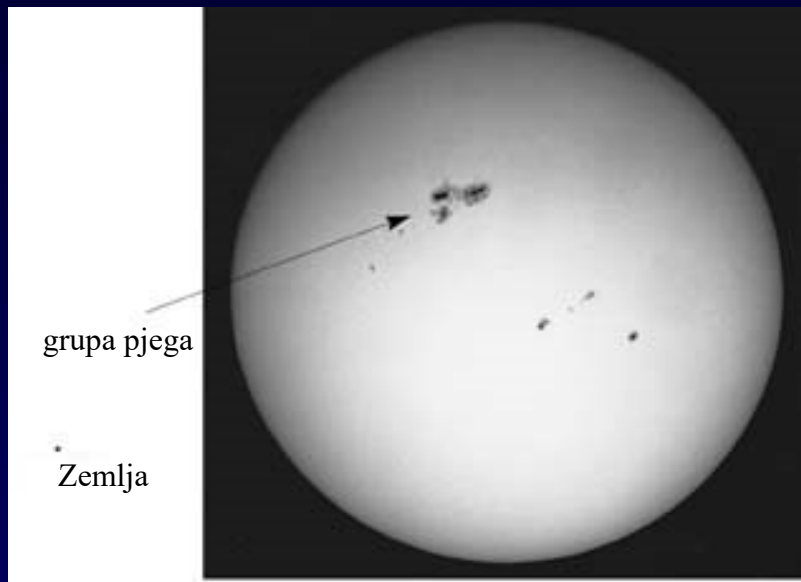
A large space storm in 1989 caused currents which damaged this transformer and shut off power for six million people for nine hours.



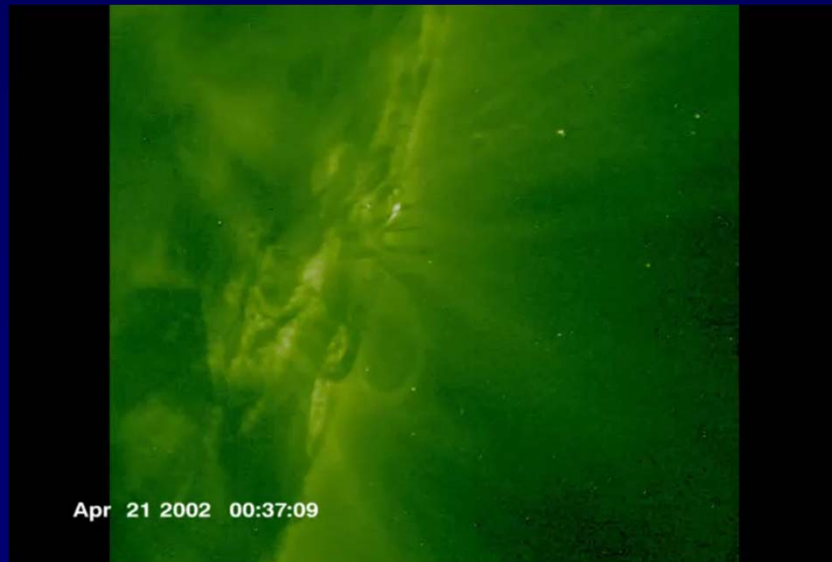
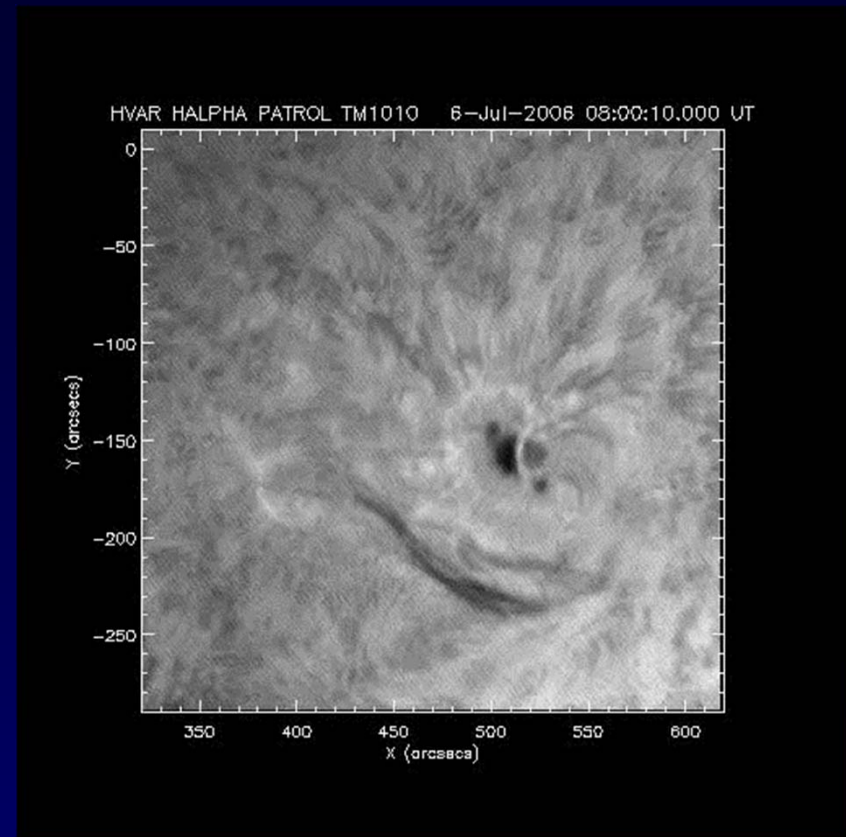
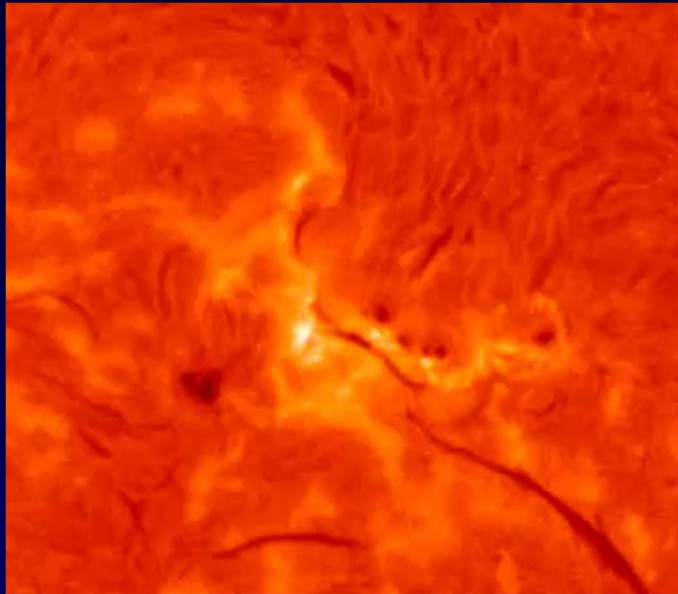
*Polarna svjetlost u Slavoniji,  
nimio M. Karakaš, 20. studenog 2003.*



# Sunčeva aktivnost



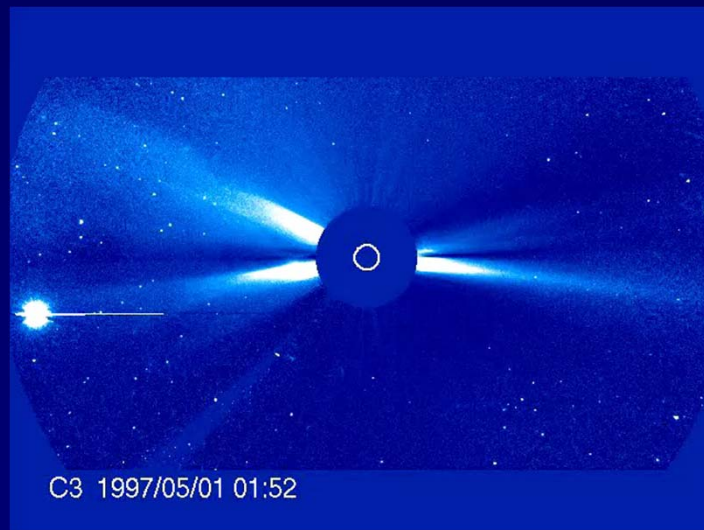
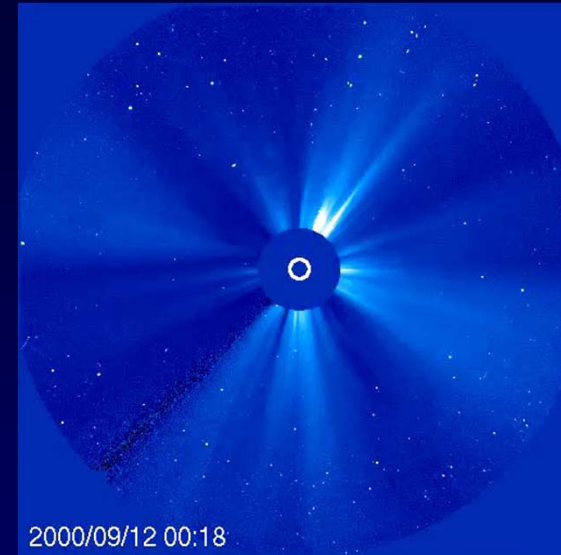
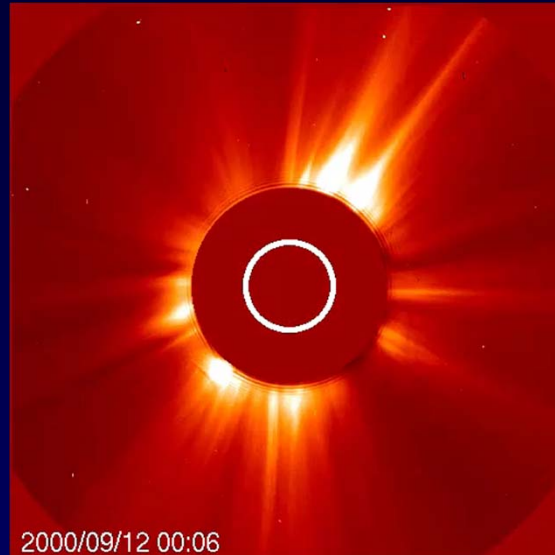
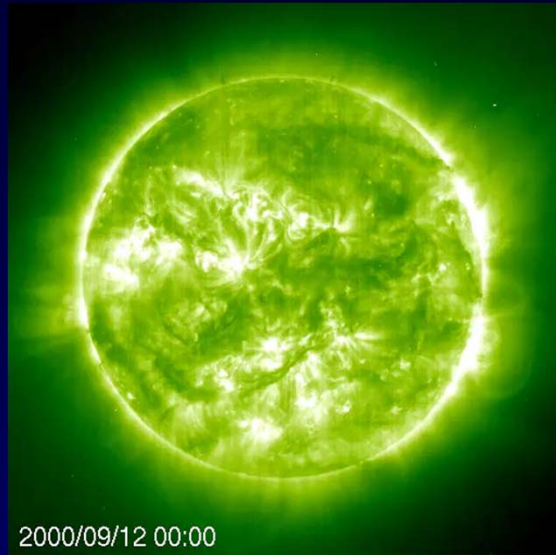
# Sunčevi bljeskovi



Apr 21 2002 00:37:09

- 40 milijuna K
- snopovi čestica
- EUV i X zračenje
- provale radio zračenja

# Sunčeve erupcije (koronini izbačaji)



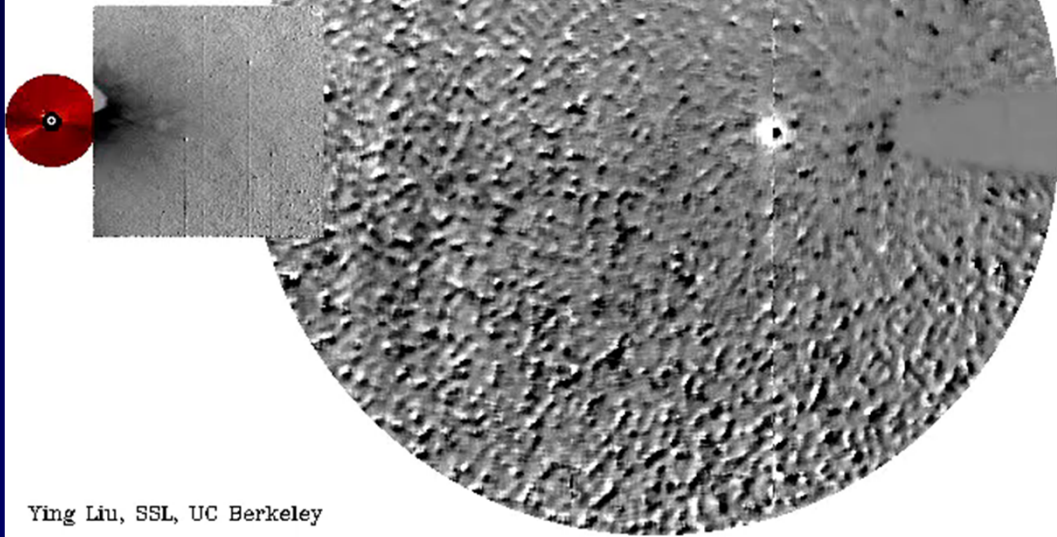
brzina = 1000 km/s  
masa = nekoliko milijardi tona  
energija = 100 milijardi A-bombi

STEREO B 08/12/12

COR2: 02:08:05

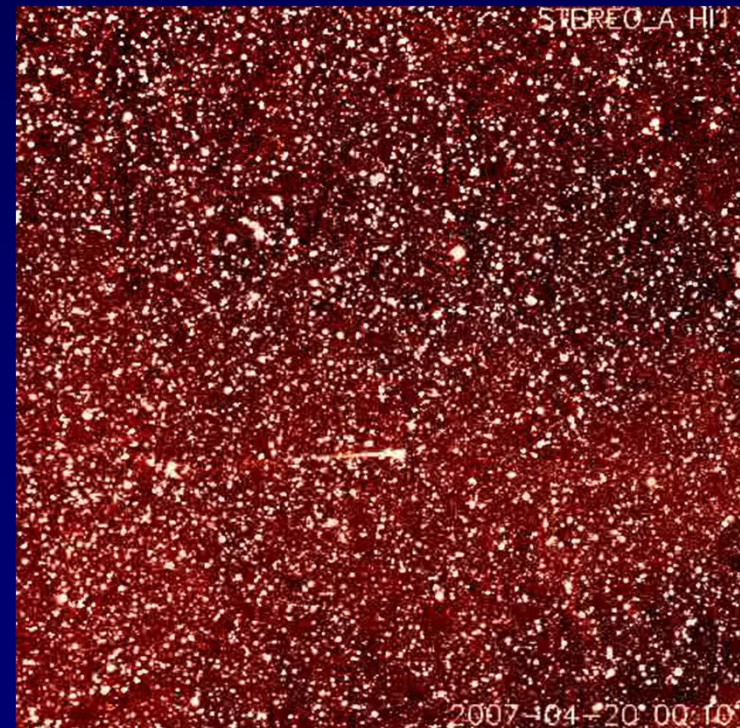
HI1: 02:09:36

HI2: 02:09:56

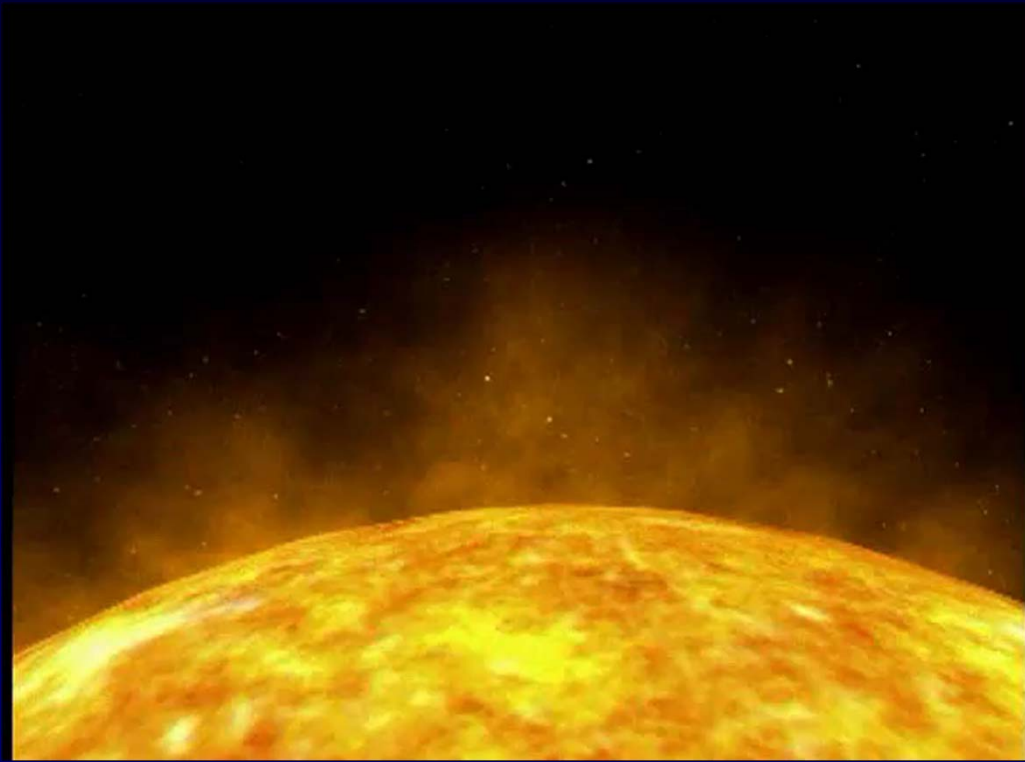


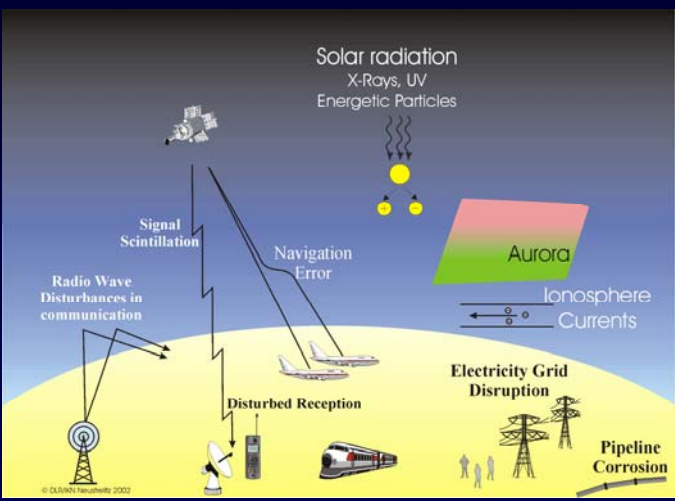
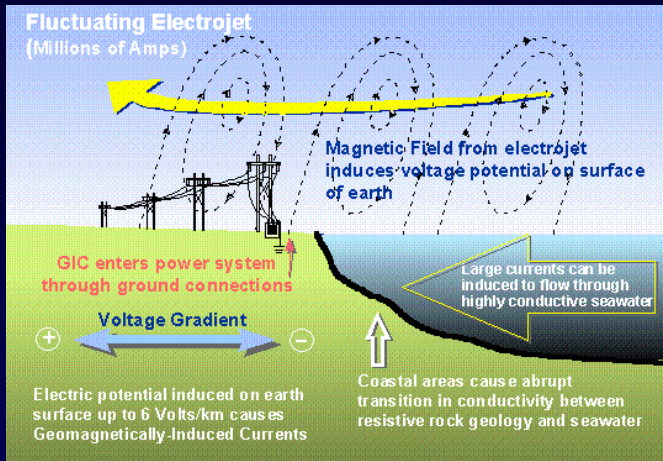
Ying Liu, SSL, UC Berkeley

“Drag-based model”



# Utjecaja Sunčeve aktivnosti na Zemlju





**PJM Public Service Step Up Transformer**

Severe internal damage caused by the space storm of 13 March, 1989

A large space storm in 1989 caused currents which damaged this transformer and shut off power for six million people for nine hours.

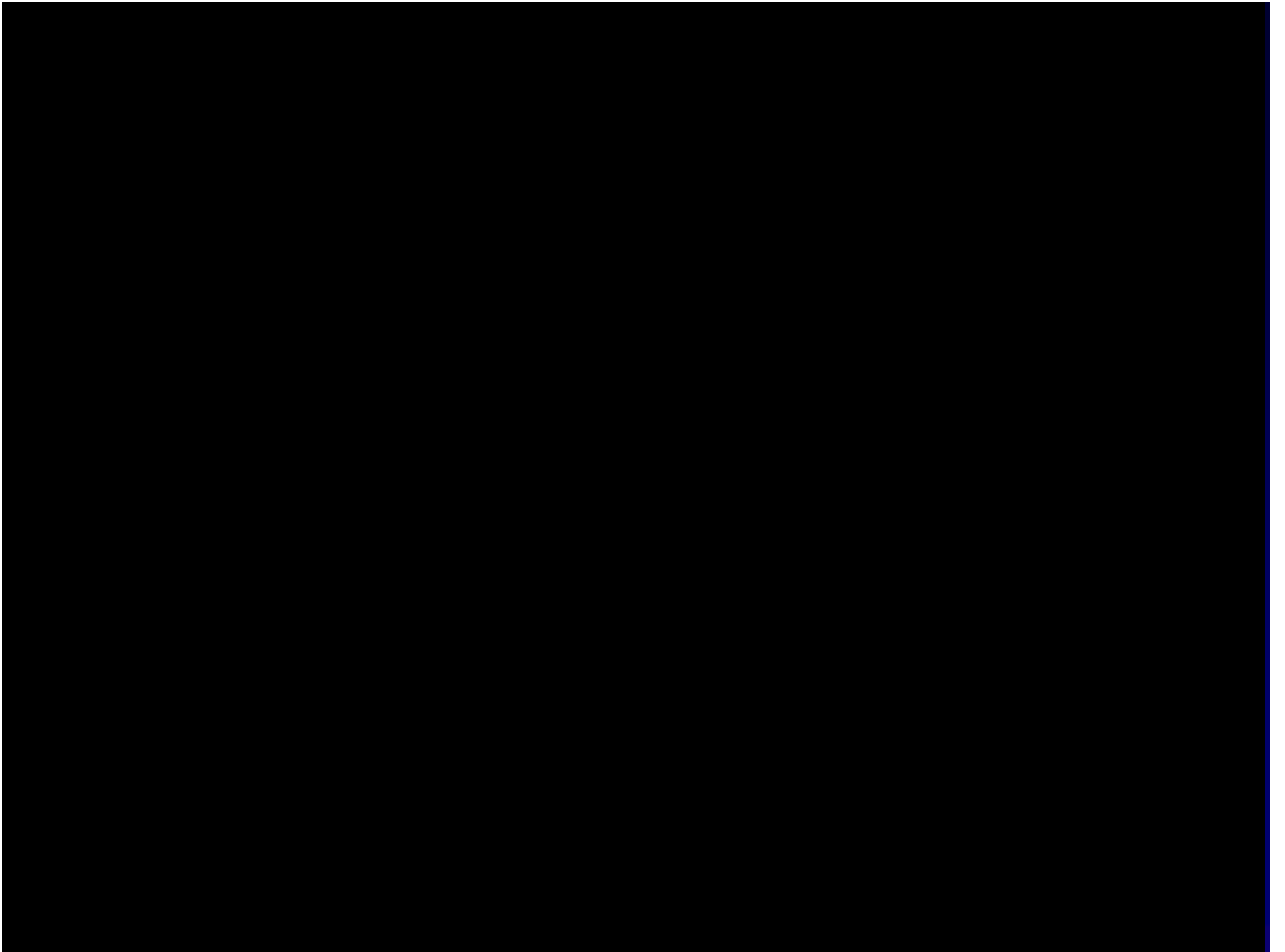


*Polarna svjetlost u Slavoniji, s nimio M. Karakaš, 20. studenog 2003.*

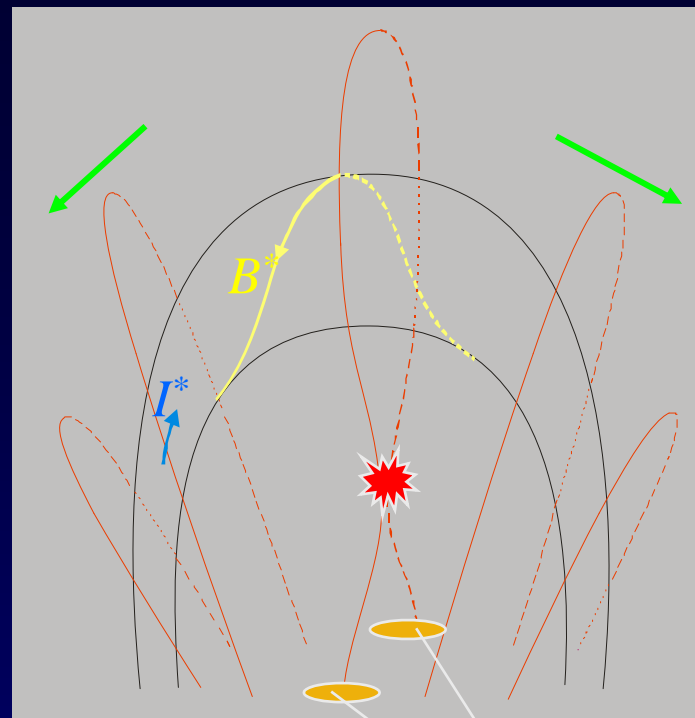
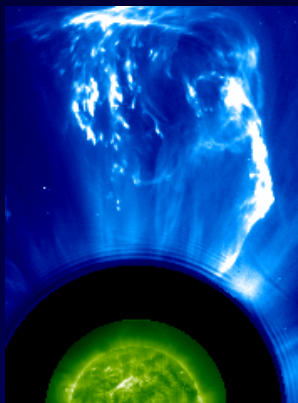


**HVALA NA PAŽNJI !**

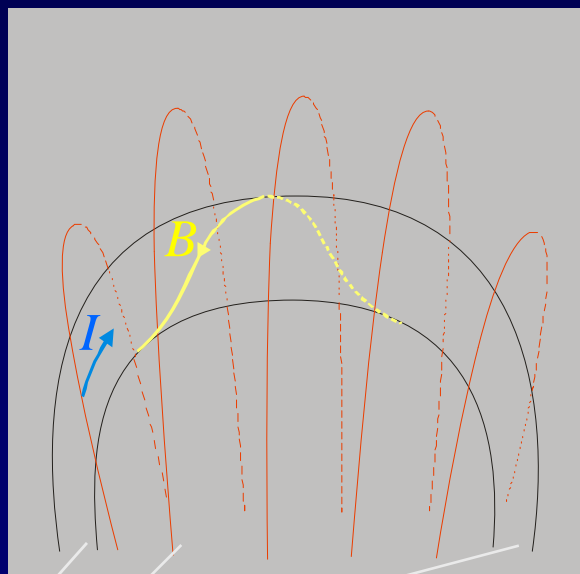




# 3-D "flux-rope" modeli

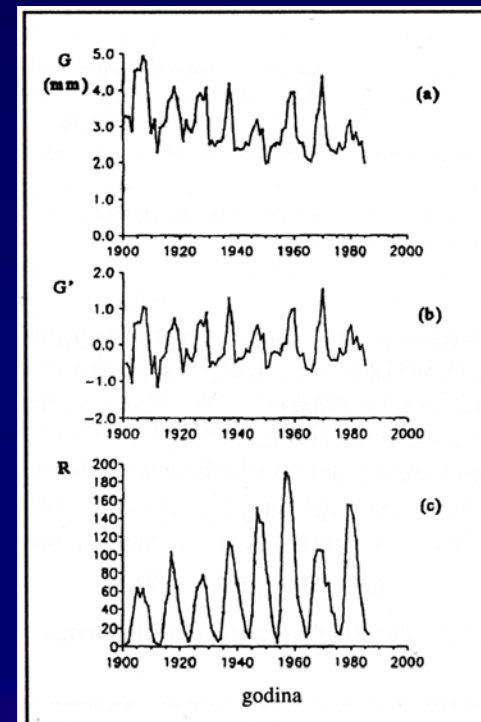
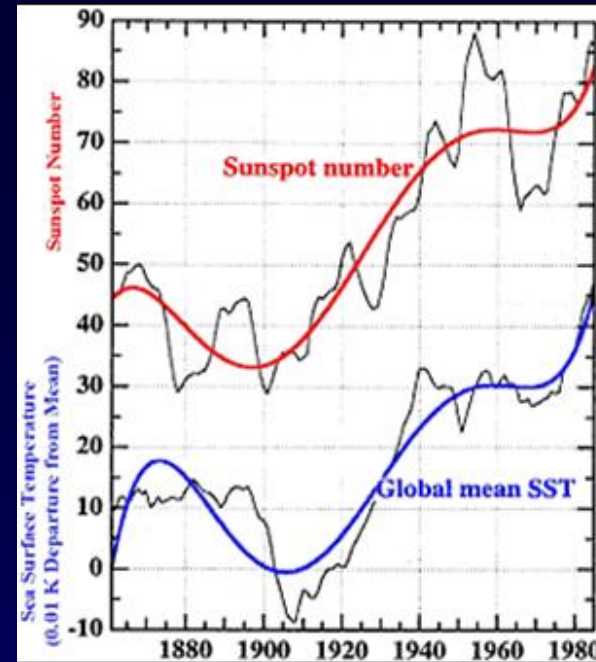
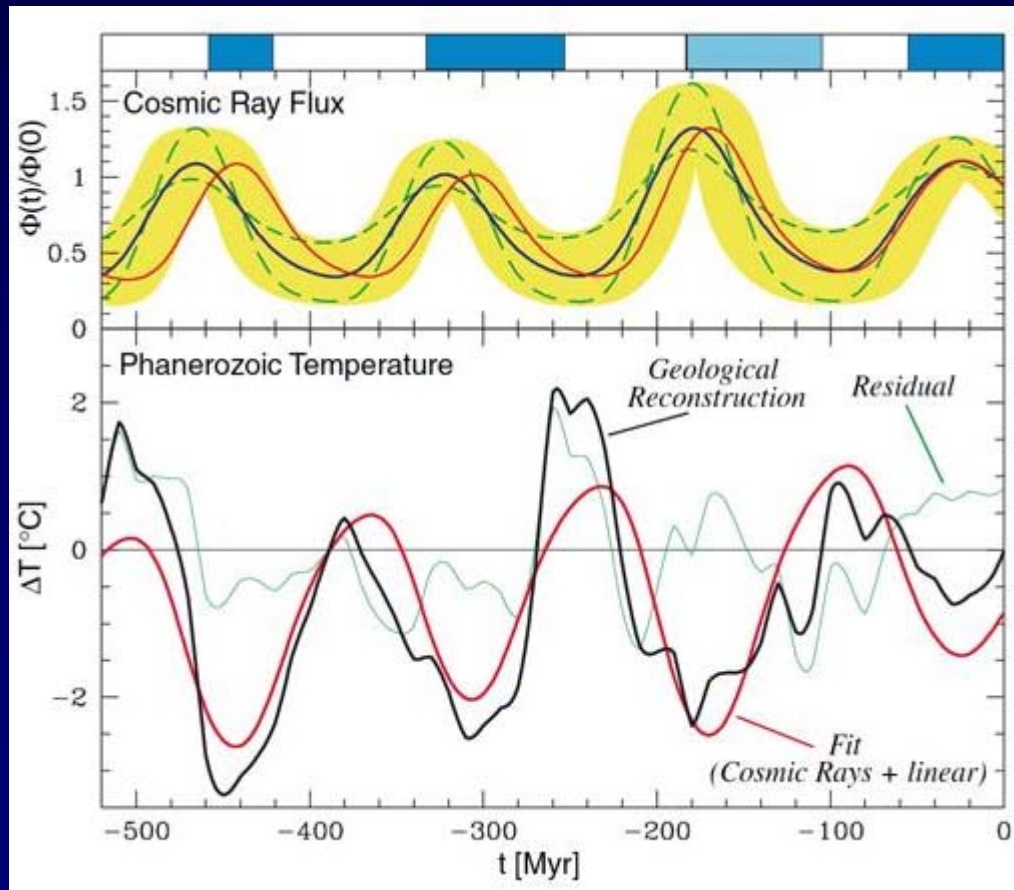


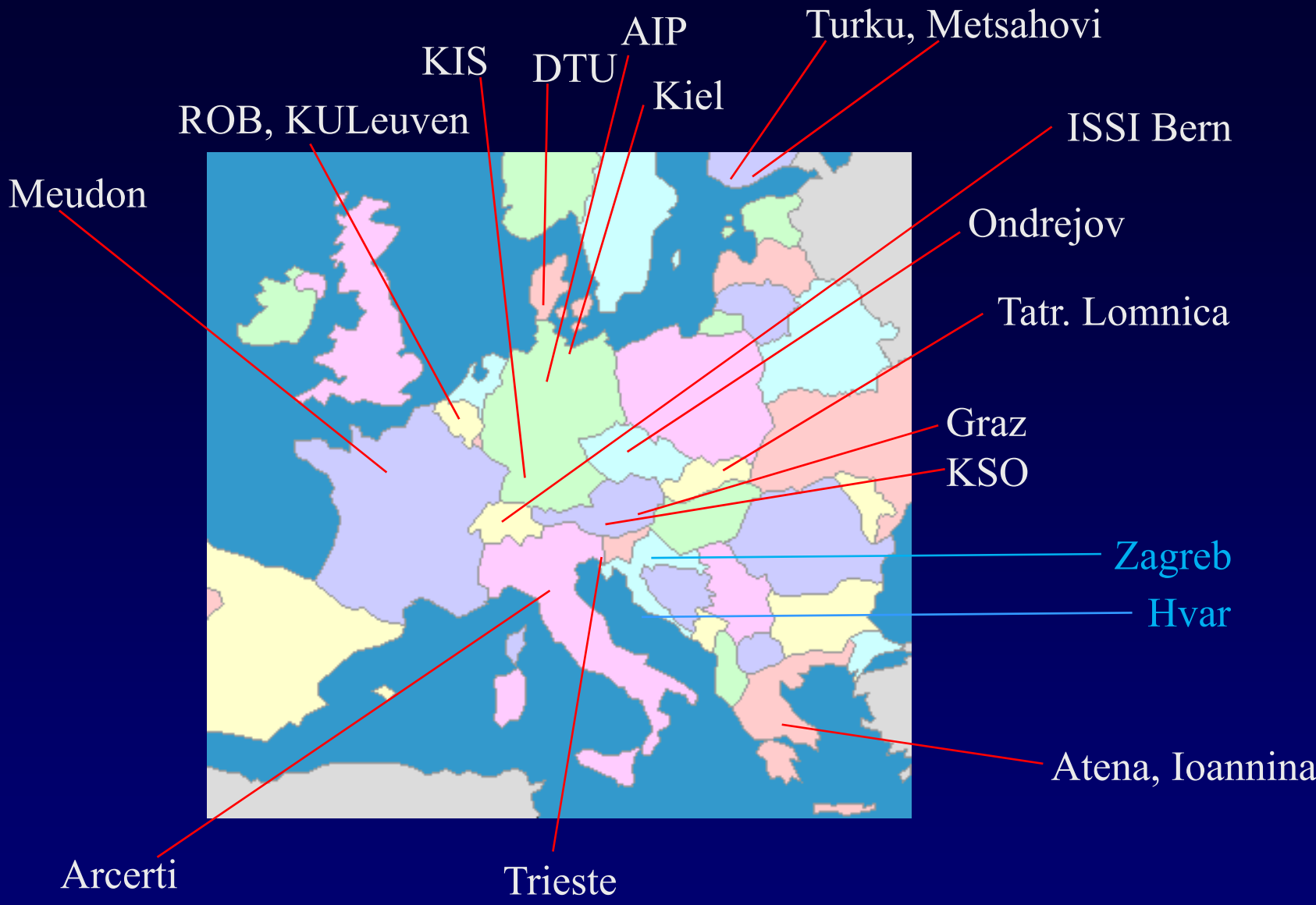
HXR, Ha



"usidrenost"

# Utjecaj Sunčeve aktivnosti na klimu

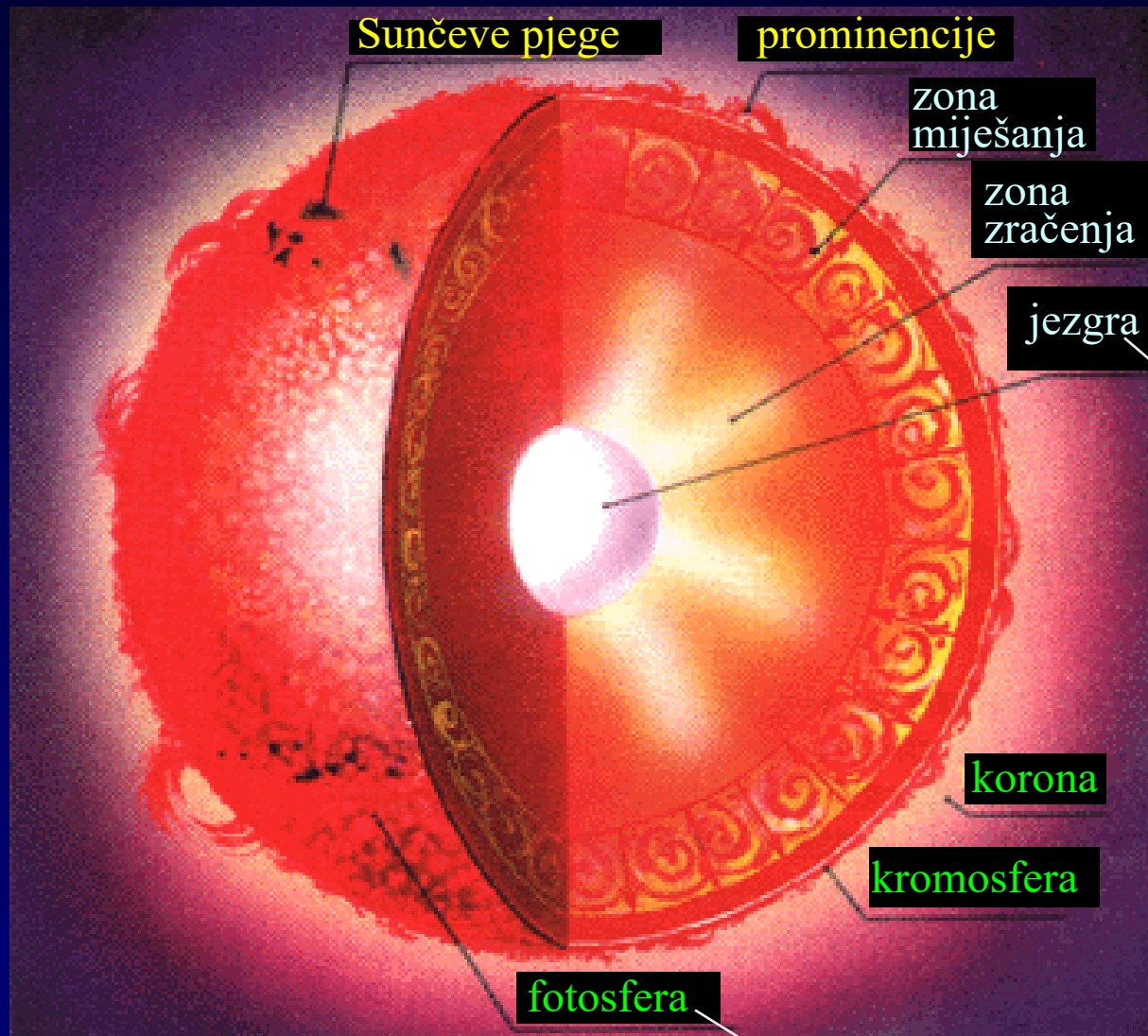




**US:** AFRL, NRL, MLSO, UAH, NASA-GSFC  
**Indija:** Udaipur Solar Obs., Karumathur  
**Kina:** CAS



# Struktura Sunca



91% = vodik  
9% = helij  
ostalo = 0.1%

15 milijuna K  
gustoća =  $150 \times \text{H}_2\text{O}$   
(1 L = 150 kg)

$4\text{H} \rightarrow \text{He}$   
(600 milijuna  
tona / s)

5800 K

Sunce = zvijezda