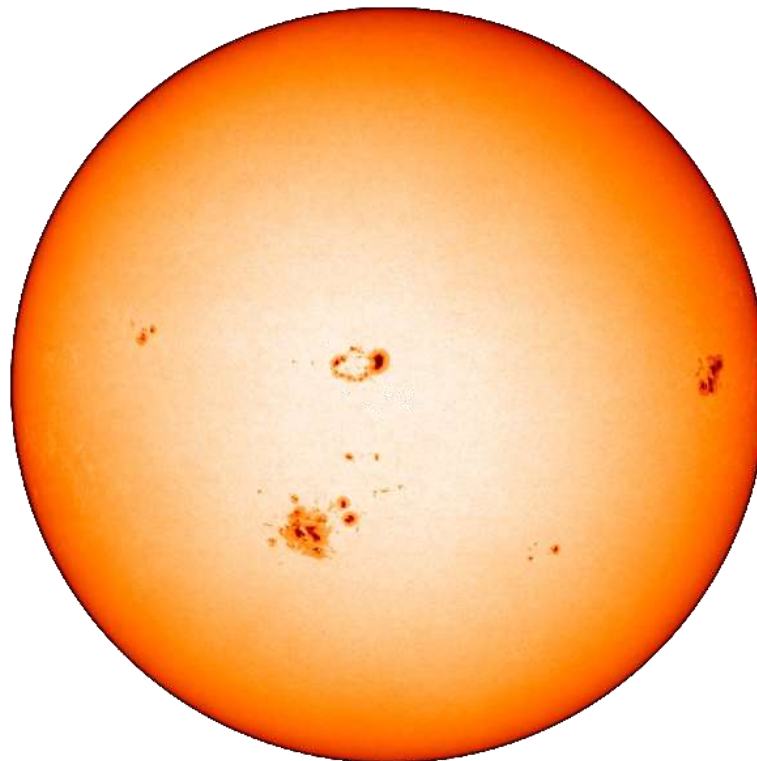


# Slnko v ZOO



**PROGRAM  
CEZHRANIČNEJ  
SPOLUPRÁCE**

SLOVENSKÁ REPUBLIKA  
ČESKÁ REPUBLIKA

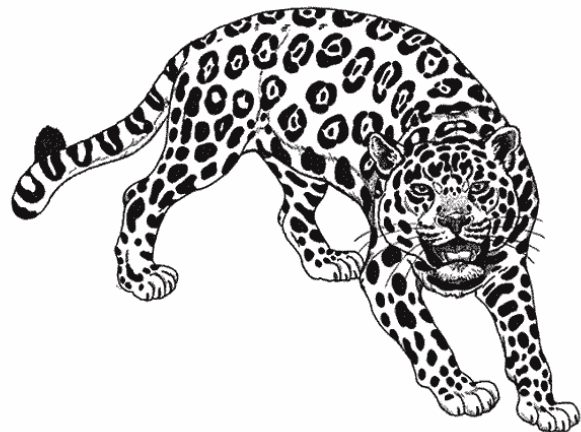


**EURÓPSKA ÚNIA  
EURÓPSKY FOND  
REGIONÁLNEHO ROZVOJA**

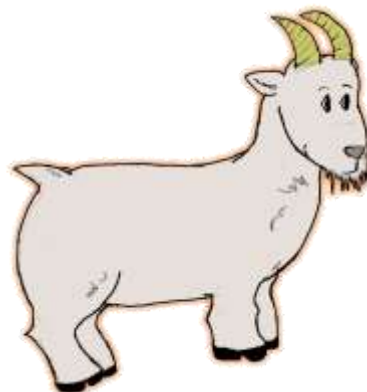
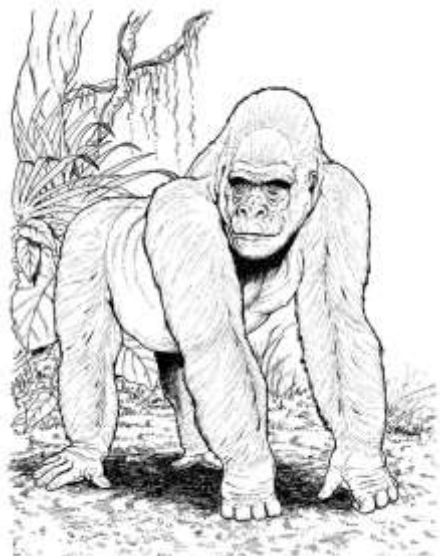
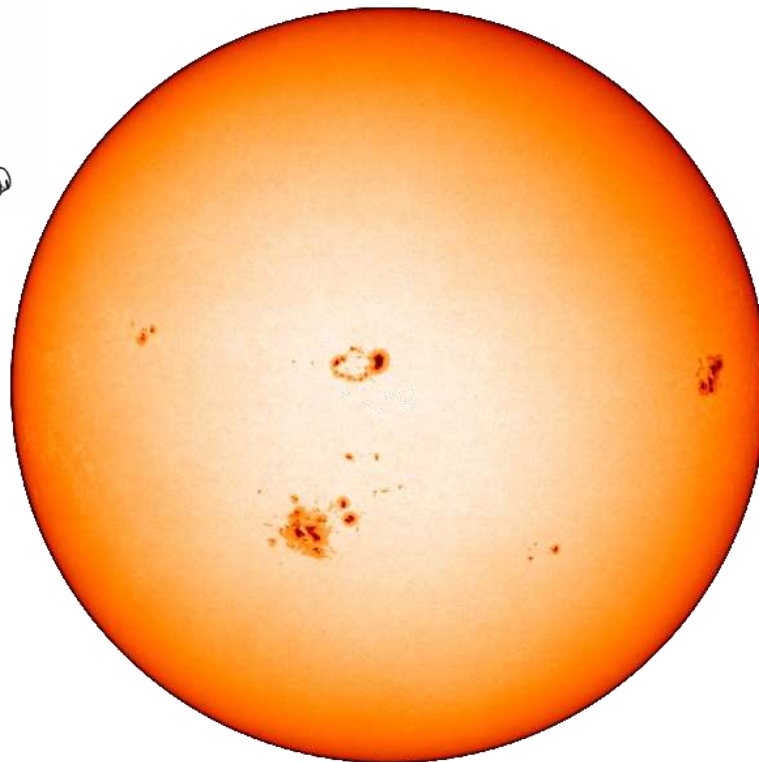
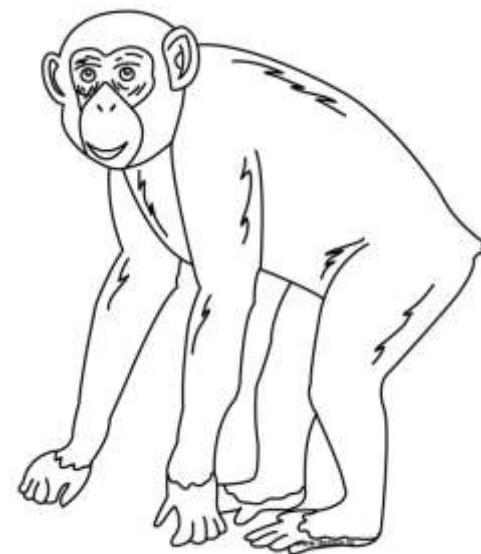
SPOLOČNE BEZ HRANÍC

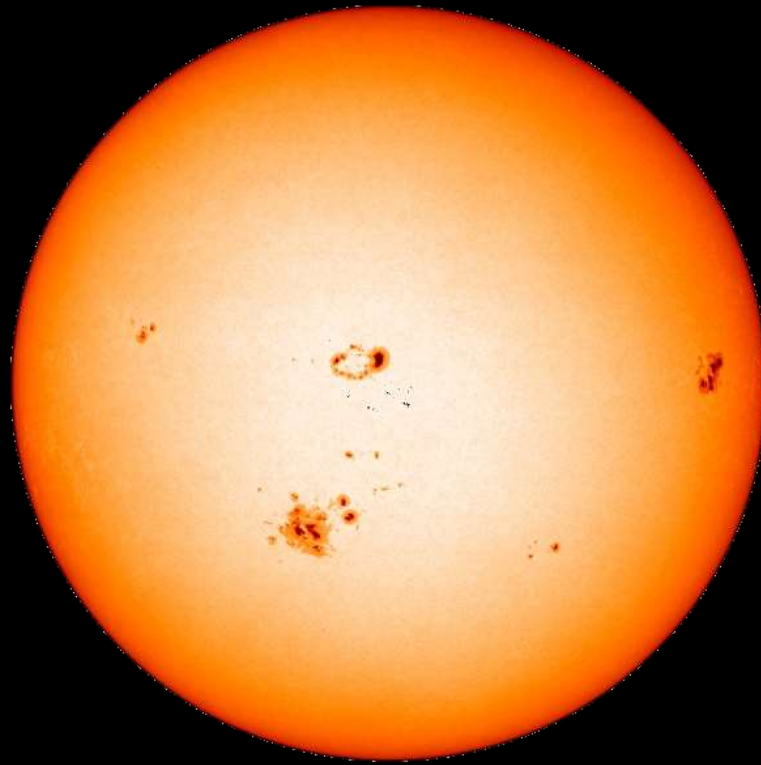


FOND MIKROPROJEKTŮ



# Slnko v ZOO





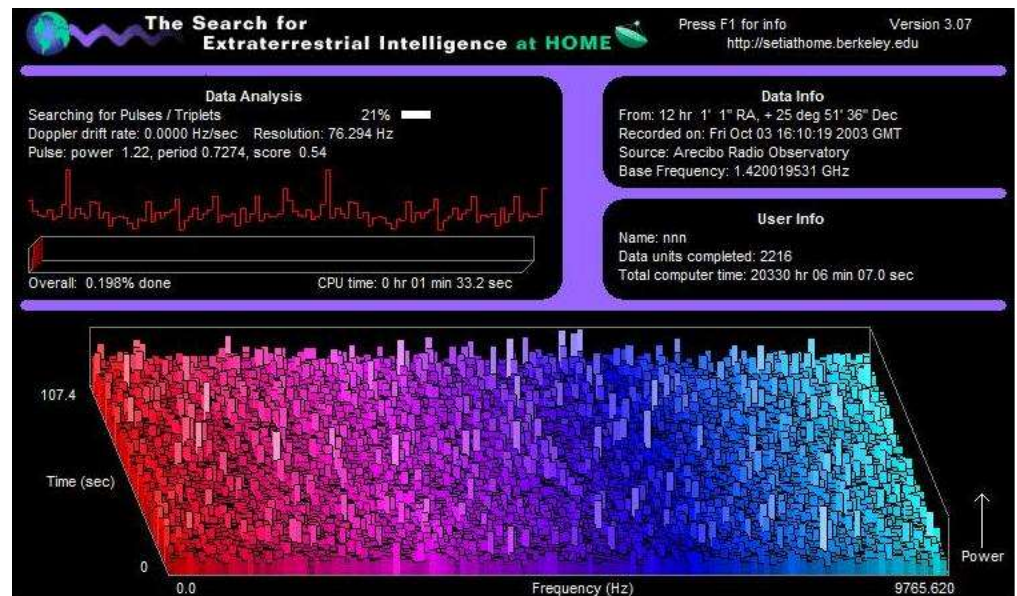
# ZOONIVERSE

REAL SCIENCE ONLINE

<https://www.zooniverse.org/>

# Cesta k ZOOniverse: SETI@home

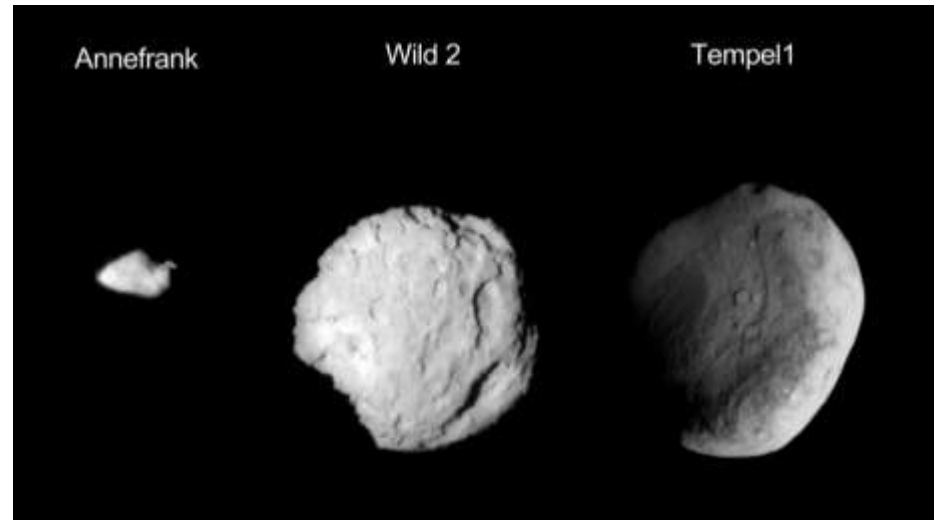
- SETI@home
- SETI = hľadanie mimozemských civilizácií analýzou kozmických rádiových signálov
- Arecibo Observatory
- Kalifornská univerzita, Berkeley
- využitie voľného výpočtového výkonu PC bez aktívneho príspevku ich majiteľov
- budúcnosť projektu neistá
  - zrušenie Arecibo Observatory
  - kauzy
  - problémy s databázou





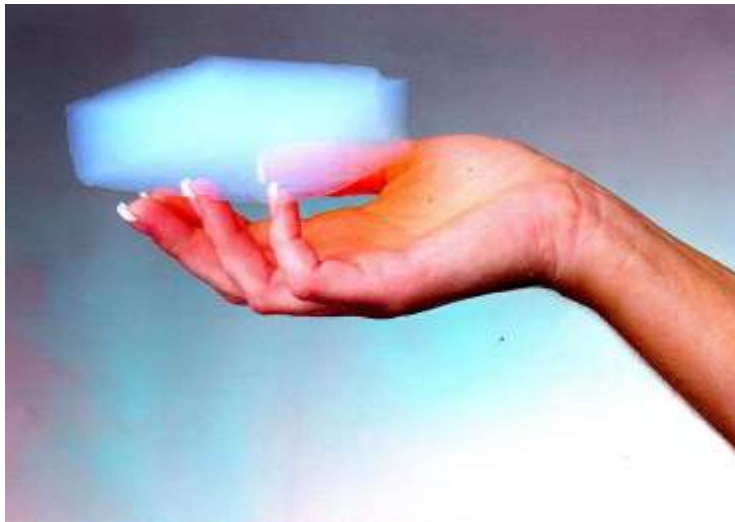
# Cesta k ZOOniverse: STARDUS@home

- STARDUST@home – občiansky vedecký projekt
- hľadanie kometárneho a interstelárneho prachu v aerogelových zberačoch sondy Stardust
- stretnutie s kométami Wild 2 (2004) a Tempel 1 (2011)
- návrat zberačov na Zem



# Cesta k ZOOniverse: STARDUST@home

- STARDUST@home – občiansky vedecký projekt
- hľadanie kometárneho a interstelárneho prachu v aerogelových zberačoch sondy Stardust
- stretnutie s kométami Wild 2 (2004) a Tempel 1 (2011)
- návrat zberačov na Zem



# Cesta k ZOOuniverse: Galaxy ZOO

- veda všeobecne sa začína potýkať s **problémom záplavy dát**
- Sloan Digital Sky Survey, 2,5-m robotický teleskop, Nové Mexiko
- potreba klasifikácie galaxií
- potreba klasifikovať 1 000 000 galaxií, skúsený astronóm: 50 000 týždenne
- ľudský zrak a mozog dokážu ďaleko lepšie klasifikovať galaxie ako akýkoľvek automatický program
- autori myšlienky:  
Kevin Schawinski, Chris Lintott




# <http://www.galaxyzoo.org/>

[CLASSIFY](#) [SCIENCE](#) [STORY](#) **GALAXY ZOO** [ASTRONOMERS](#) [DISCUSS](#) [PROFILE](#)

## Few have witnessed what you're about to see

Experience a privileged glimpse of the distant universe, observed by the Sloan Digital Sky Survey and Hubble Space Telescope




We are trying something new! Come help us understand a very specific type of galaxy and experience science from start to end. [Join now](#)

### Classify Galaxies

To understand how galaxies formed we need your help to classify them according to their shapes. If you're quick, you may even be the first person to see the galaxies you're asked to classify.

[Begin Classifying](#)



### How Do Galaxies Form?

Roughly one hundred billion galaxies are scattered throughout our observable Universe, each a glorious system that might contain billions of stars. Many are remarkably beautiful, and the aim of Galaxy Zoo is to study them, assisting astronomers in attempting to understand how the galaxies we see around us formed, and what their stories can tell us about the past, present and future of our Universe as a whole. [MORE](#)

### History of Galaxy Zoo


The launch of this new version of Galaxy Zoo, the 4th, comes just a few weeks after the site's 5th birthday. It all started back in July 2007, with a data set made up of a million galaxies imaged by the Sloan Digital Sky Survey, who still provide some of the images in the site today. With so many galaxies, we'd assumed it would take years for visitors to the site to work through them all, but within 24 hours of launch we were stunned to be receiving almost 70,000 classifications an hour. In the end, more than 50 million classifications were received by the project during its first year, contributed by more than 150,000 people. [MORE](#)

### Galaxy Zoo in the Classroom

Are you an educator? Would you like to use Galaxy Zoo with a group of students? The [NAVIGATOR](#) is an interactive tool that allows groups to classify galaxies together and then investigate galaxy characteristics. [ZOO TEACH](#) is where educators can share lessons, resources and that complement the citizen science projects that are part of the Zooiverse.

[Navigator](#)

### Recent Images



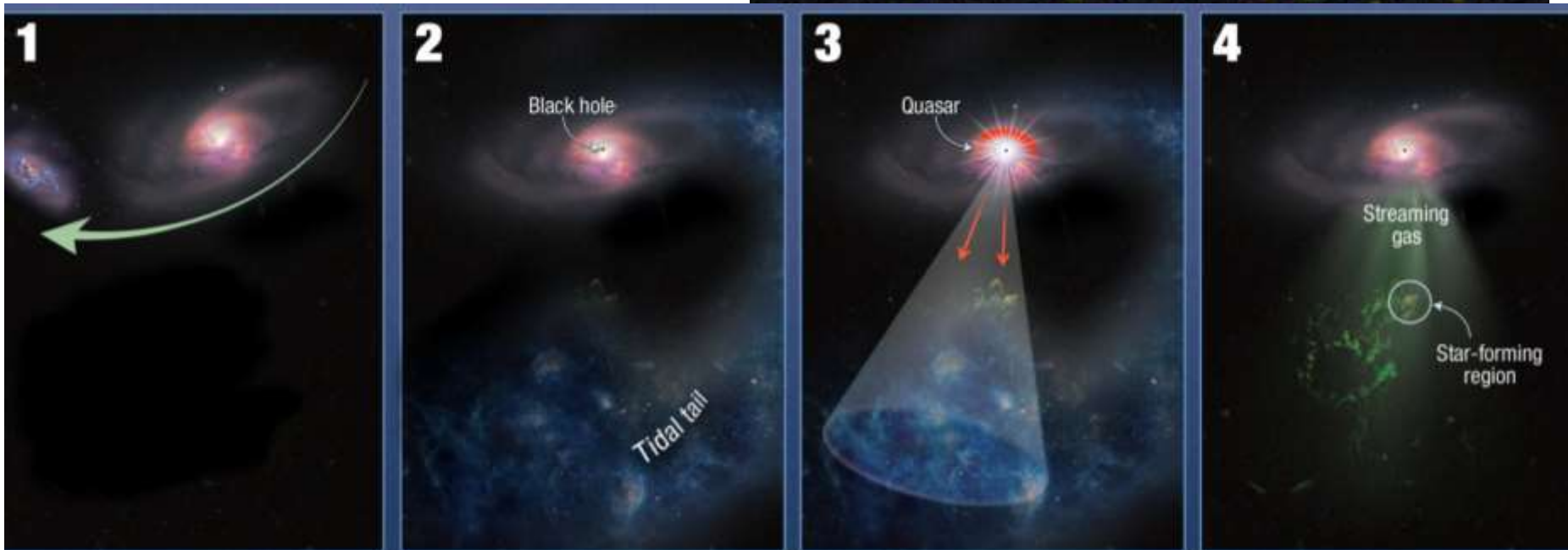


# Objavy v Galaxy Zoo: Hannyin objekt

## Čo je tá zelená vec?

- náhodný objav mladej holandskej učiteľky Hanny van Arkel týždeň potom, ako sa zapojila do projektu
- Hannyin objekt je pravdepodobne **svetelné echo** vyvolané aktívnym jadrom (kvazarom) blízkej galaxie

[Hannyin objekt](#)



# ZOOniverse na scéně

<https://www.zooniverse.org/#space>

**ZOONIVERSE**  
REAL SCIENCE ONLINE

Take part in  
Science Projects


Experiment in  
Laboratory

[galaxyzoo.org](#)  
**How do galaxies form?**  
[View details](#)

All **Space** Climate Humanities Nature Biology


Space

Sort by Category




**How do galaxies form?**  
NASA's Hubble Space Telescope archive provides hundreds of thousands of galaxy images.

GALAXY ZOO




**Explore the surface of the Moon**  
We hope to study the lunar surface in unprecedented detail.

MOON ZOO




**Study explosions on the Sun**  
Explore interactive diagrams to learn about the Sun and the spacecraft monitoring it.

SOLAR STORMWATCH




**Find planets around stars**  
Lightcurve changes from the Kepler spacecraft can indicate transiting planets.

planethunters.org




**How do stars form?**  
We're asking you to help us find and draw circles on infrared image data from the Spitzer Space Telescope.

THE MILKY WAY PROJECT



**Explore the Red Planet**  
Planetary scientists need your help to discover what the weather is like on Mars.

PLANET FOUR



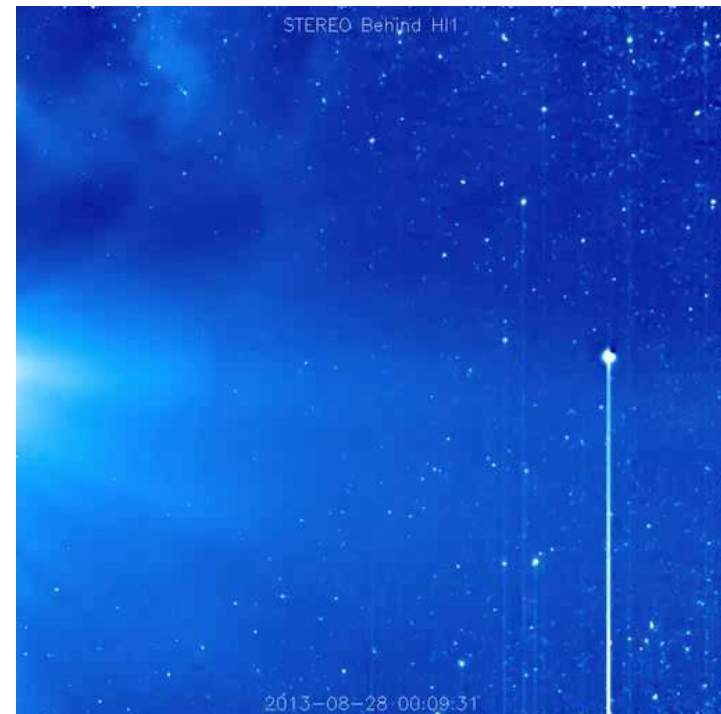
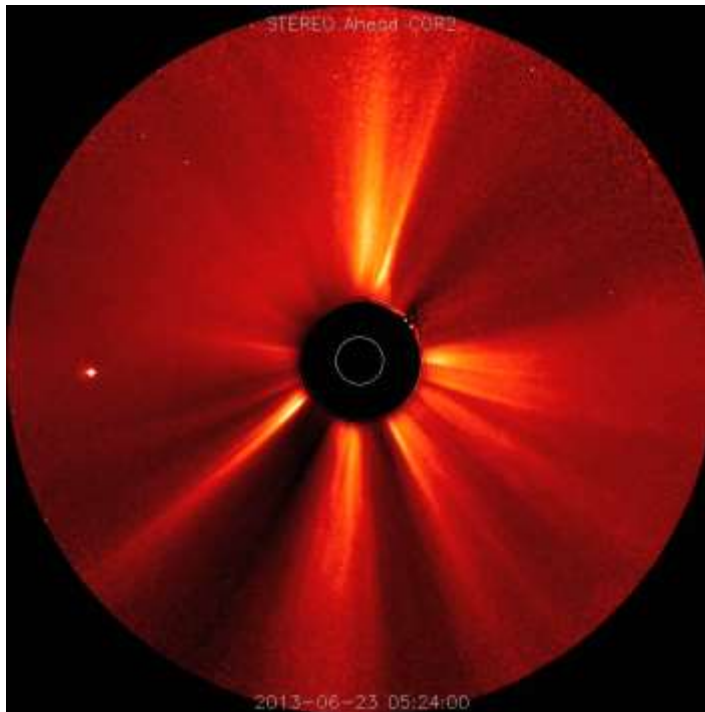
**Help us find gravitational lenses**  
Imagine a galaxy behind another galaxy. Think you won't see it? Think again.

SPACEWARPS

# Slnko v ZOOuniverse

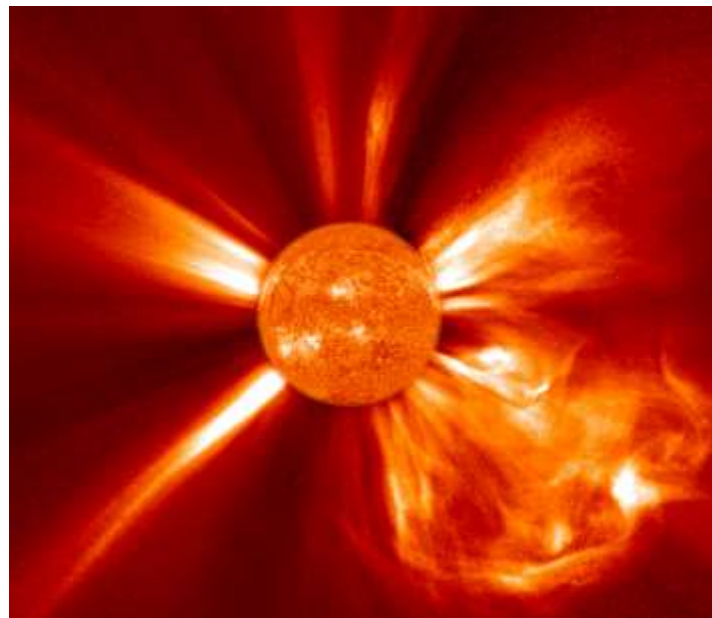
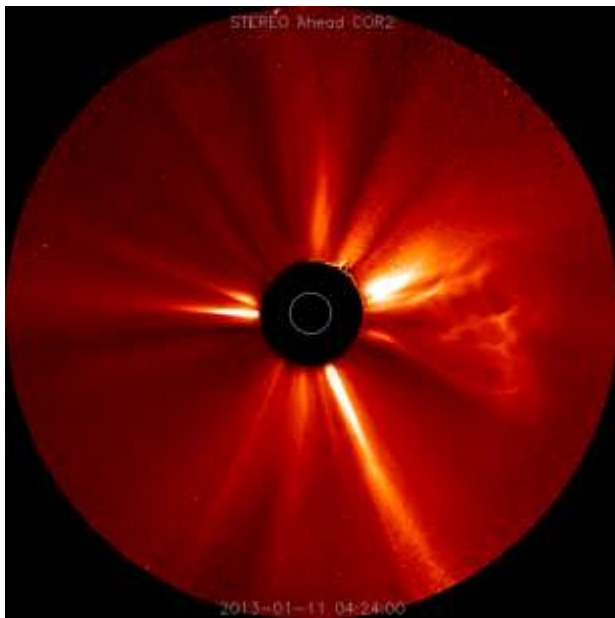
<http://www.solarstormwatch.com/>

- Solar Stormwatch = Slnčná búrková hliadka
- občiansky vedecký projekt zameraný na:
  - vyhľadávanie výronov koronálnej hmoty (CME) v databázach kozmických slnečných observatórií STEREO A(head) a STEREO B(hind)
  - meranie charakteristík CME
- CME = Coronal Mass Ejection = výron koronálnej hmoty = slnečná búrka
- CME - hlavný hráč kozmického počasia



# Výron koronálnej hmoty CME

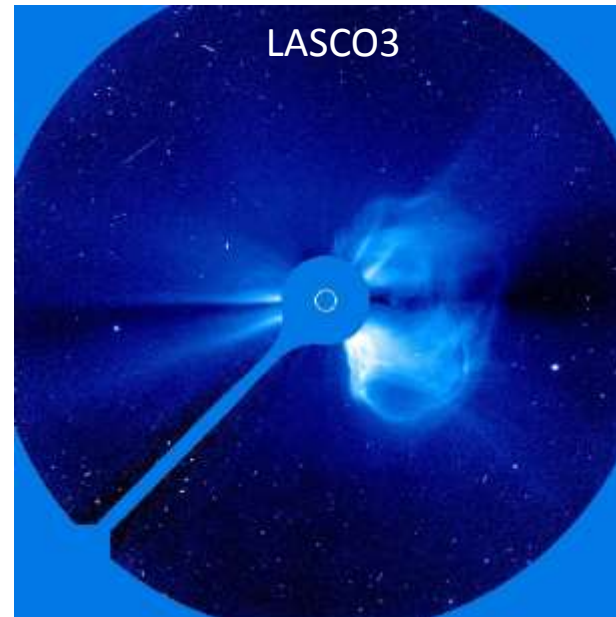
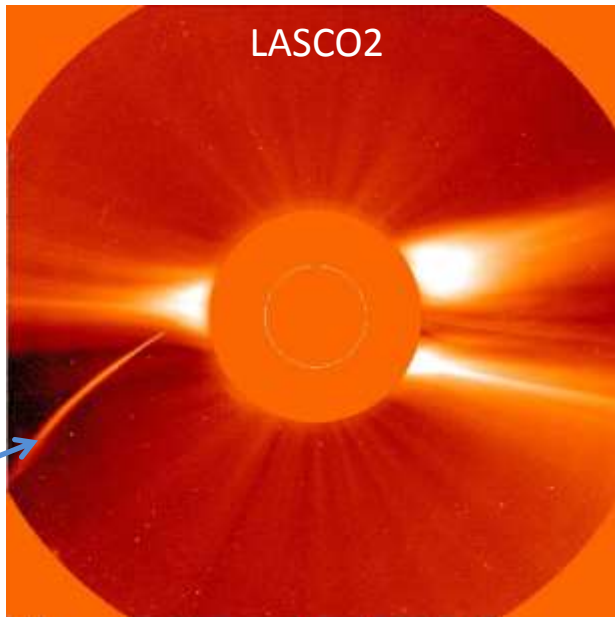
- najmohutnejší erupatívny jav v celej Slnecnej sústave
- hmotnosť vyvrhutej plazmy: miliarda ton
- rýchlosť vyvrhutej plazmy: 500 – 2000 kms<sup>-1</sup>
- interakcia magnetického poľa CME s magnetosférami planét
- pozorovateľnosť: výhradne kozmické koronografy: SoHO/LASCO  
STEREO/SECCHI/COR + HI
- čo vidíme: viditeľné svetlo fotosféry rozptýlené na nabitých časticiach plazmy



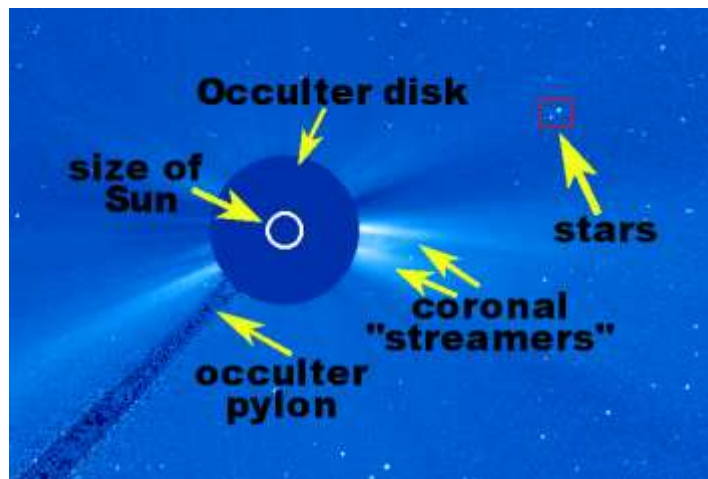
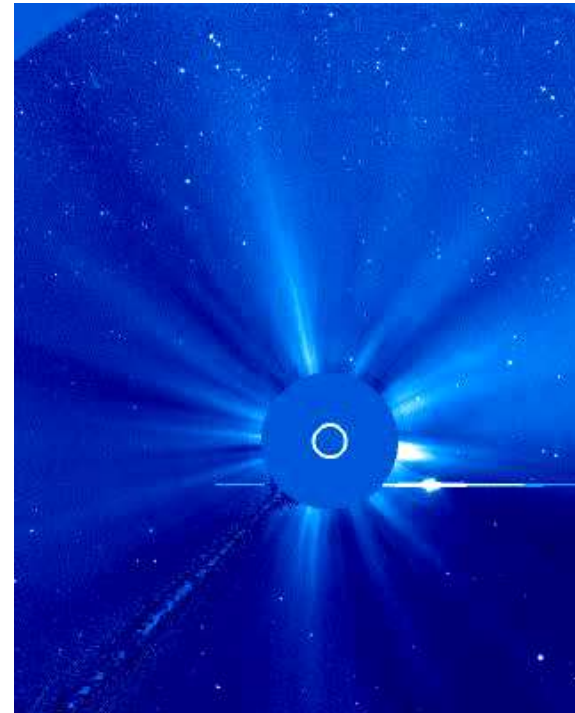
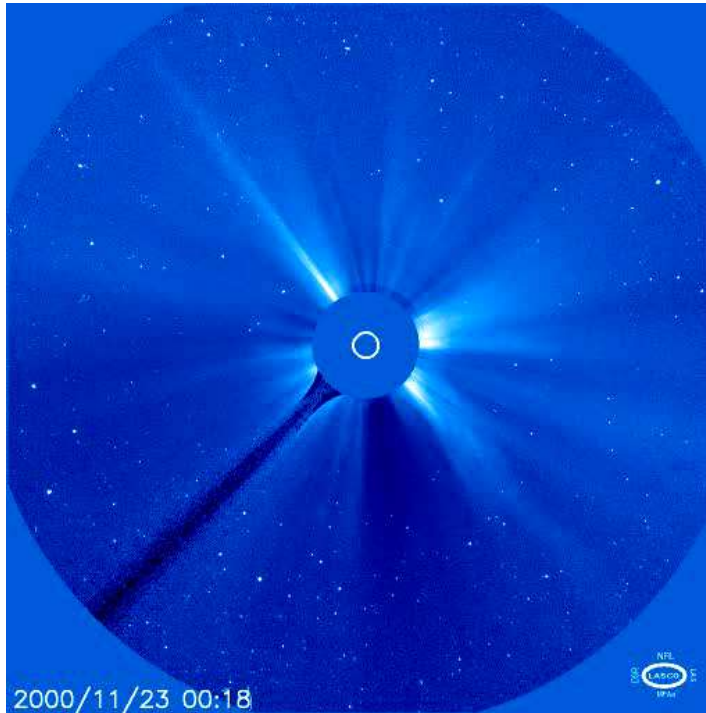


# SoHO/LASCO

- SoHO: Solar Heliospheric Observatory, od r. 1996
- LASCO: Large Angle and Spectrometric Coronagraphs  
(Širokokuhlý spektrometrický koronograf)
  - LASCO1:  $1,1 R_{\odot} - 3 R_{\odot}$  (nefunkčný od r. 1998)
  - LASCO2:  $1,5 R_{\odot} - 6 R_{\odot}$
  - LASCO3:  $3 R_{\odot} - 32 R_{\odot}$
- spektrometrický lebo LASCO2 a LASCO3 sú vybavené širokopásmovými filtermi pre vizuálnu oblasť



# CME a kométa a la LASCO3



- SoHO je historicky najúspešnejší objaviteľ komét
- k 17.9. 2013: **2 378 komét**
- väčšina objavov amatérskou verejnosťou

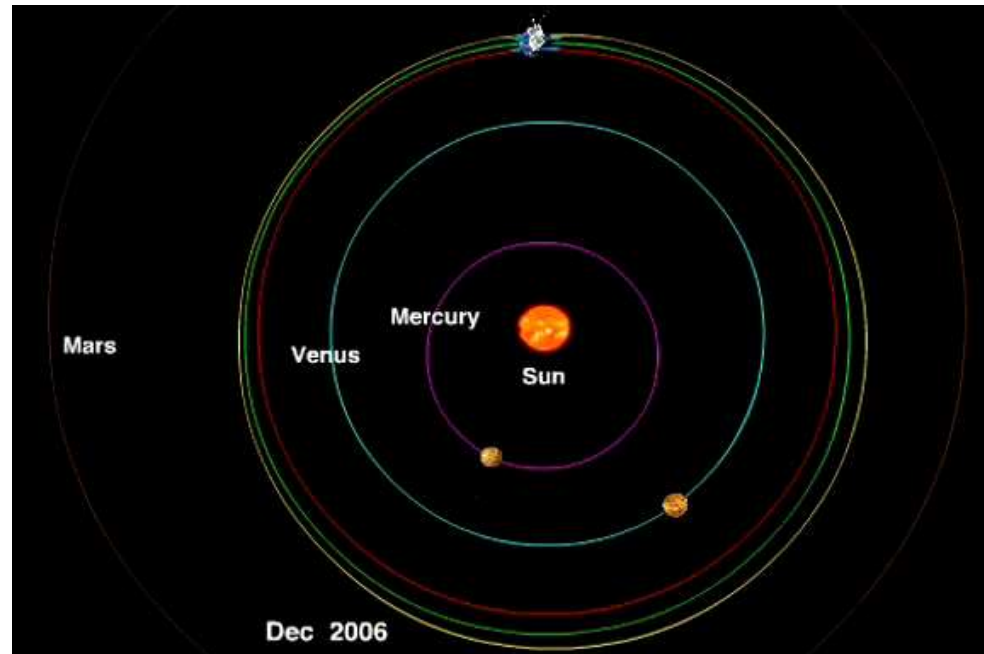
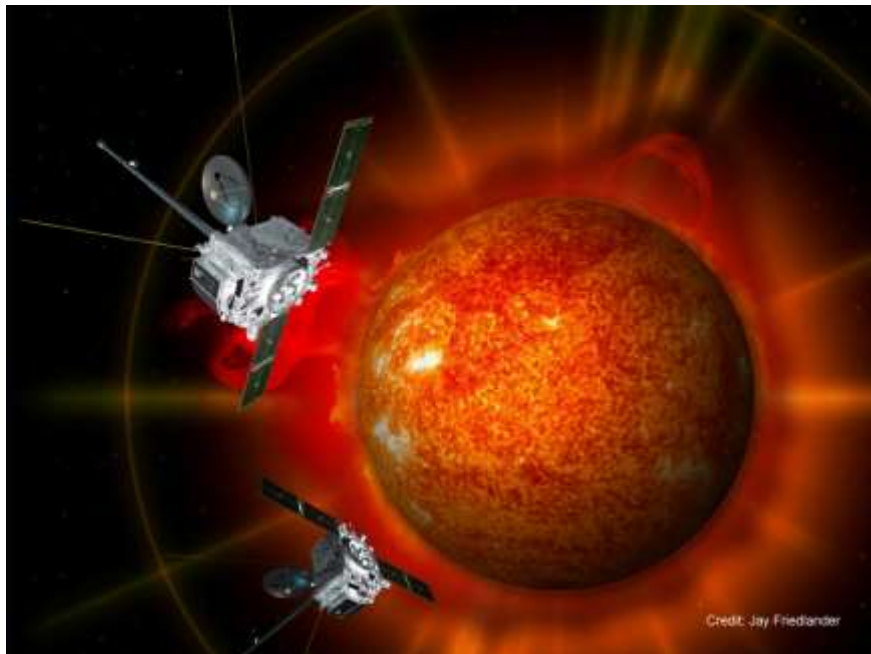
viac info: Google → Sungrazer Comets  
SoHO Comets

<http://sungrazer.nrl.navy.mil/index.php?p=guide>

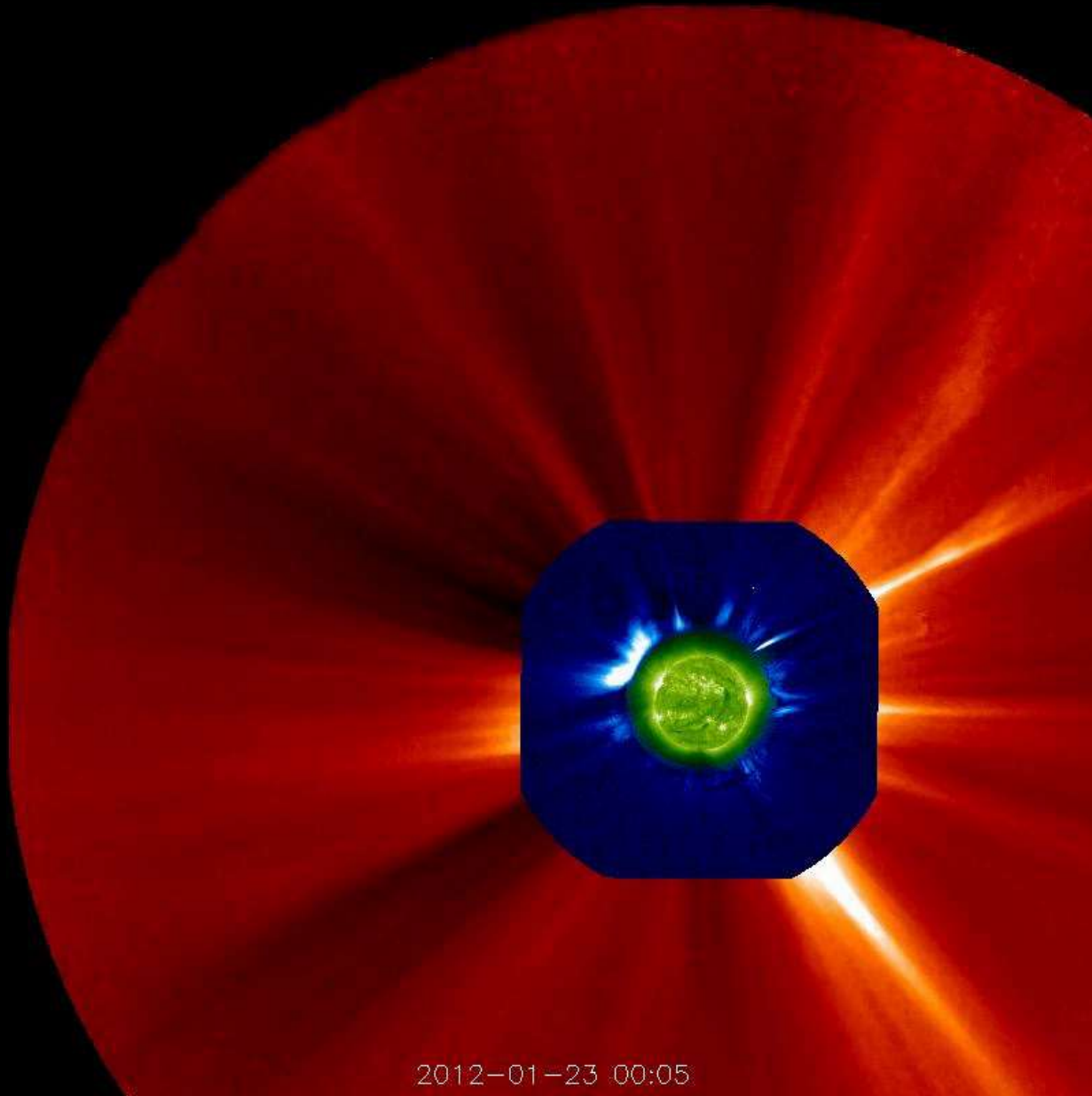
# STEREO/SECCHI/COR/HI



- STEREO: Solar-Terrestrial Relations Observatory (Observatórium slnečno-zemských vzťahov)
- dvojčky: STEREO A (Ahead) a STEREO B (Behind)
- vypustené: 26. október 2006, NASA
- SECCHI Sun Earth Connection Coronal and Heliospheric Investigation
- SECCHI/COR1 Inner coronagraph
- SECCHI/COR2 Outer coronagraph  $2 R_{\odot} - 15 R_{\odot}$
- HI1, HI2 Heliospheric Imager (inner and outer heliosphere)



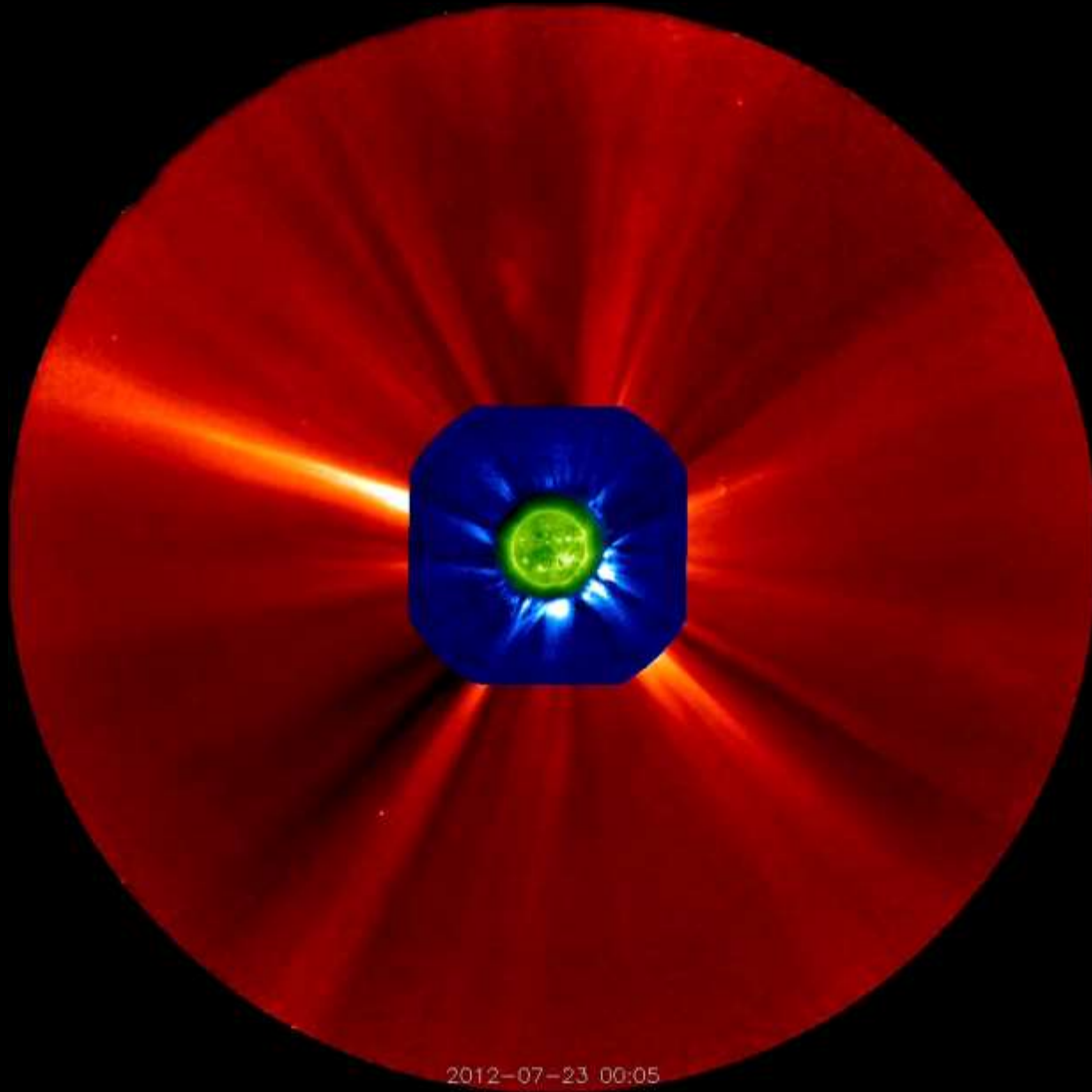
# Erupcia na limbe rozpútala slnečnú búrku



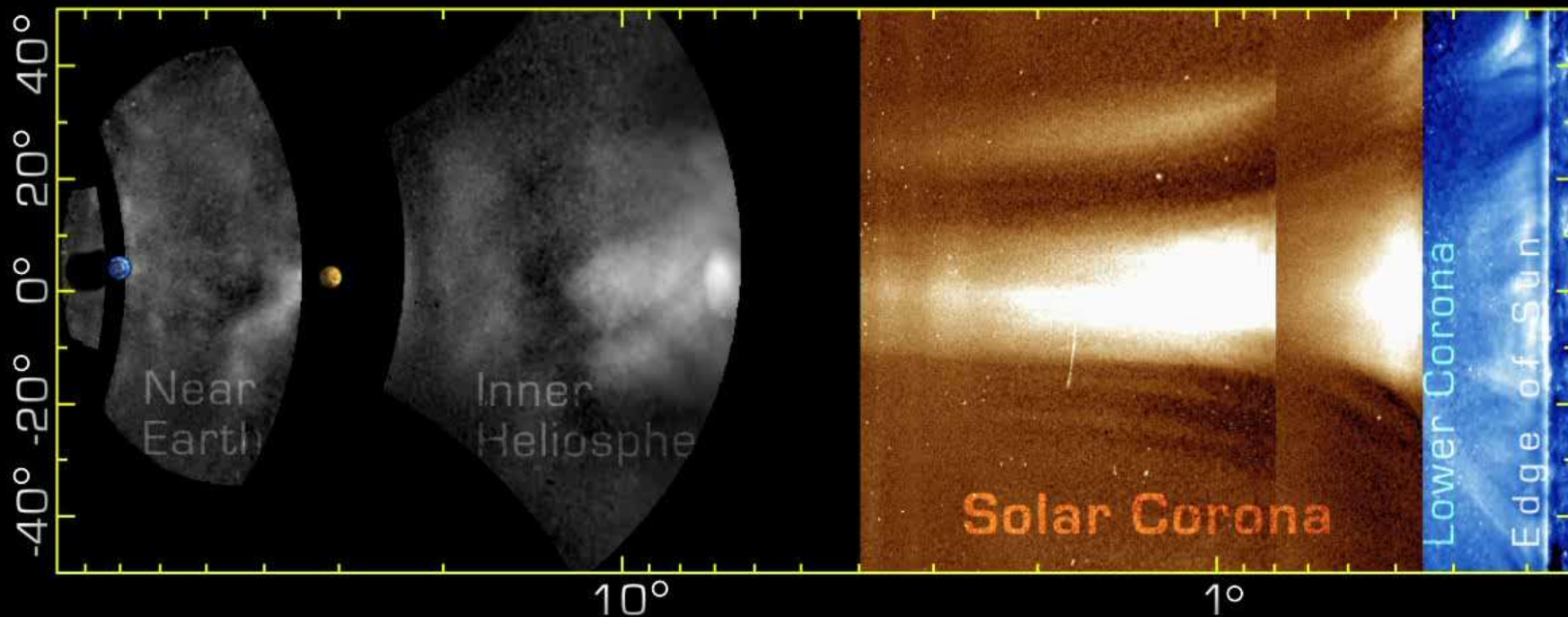
2012-01-23 00:05



# Najrýchlejšia CME: 2 930 km $s^{-1}$

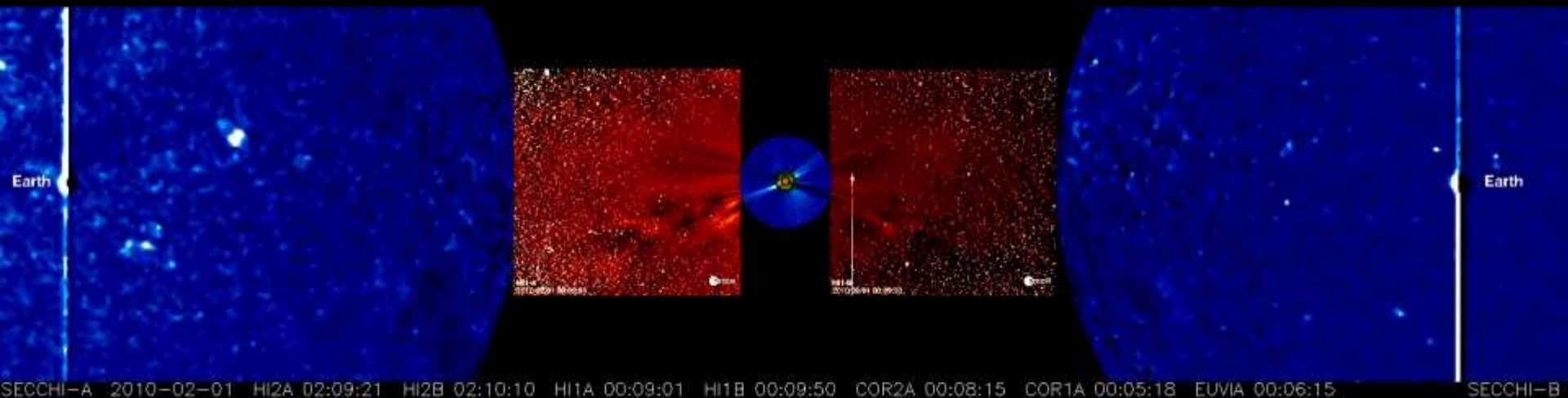


# Slnečná búrka v heliosfére 11.12. 2008



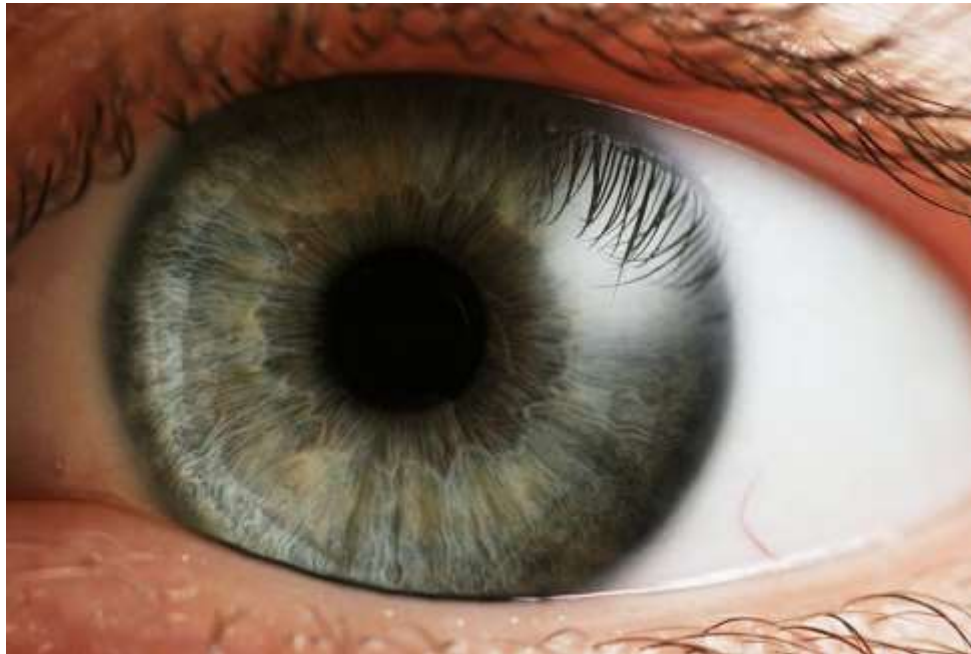
STEREO-A:12/11/08 12:47:00 AM

# Kozmické počasie v heliosfére



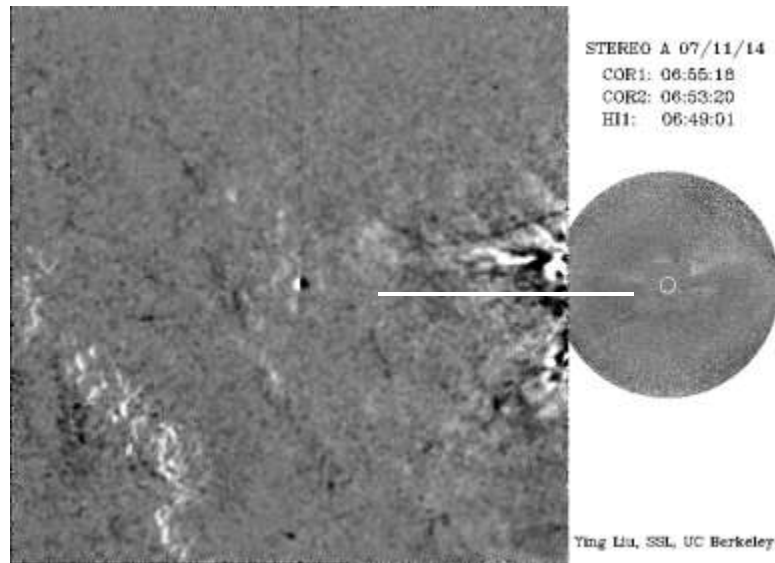
# Solar Stormwatch – motivácia

- fyzika Slnka: zahltenie dátami (dátové tsunami)
- STEREO: po dva a pol roku činnosti 100 000 obrázkov = 25 TB dat
- Solar Dynamic Observatory (AIA + HMI + EVE): 1,6 TB za deň (200 DVD)  
584 TB za rok (73 000 DVD)
- oko a vedomie sú ďaleko lepšie prispôsobené na rozoznávanie štruktúr (pattern recognition)
- oko je najlepší kompjuter
- mnohonásobné meranie získané viacerými ľuďmi je omnoho cennejšie ako subjektívny názor jedného človeka





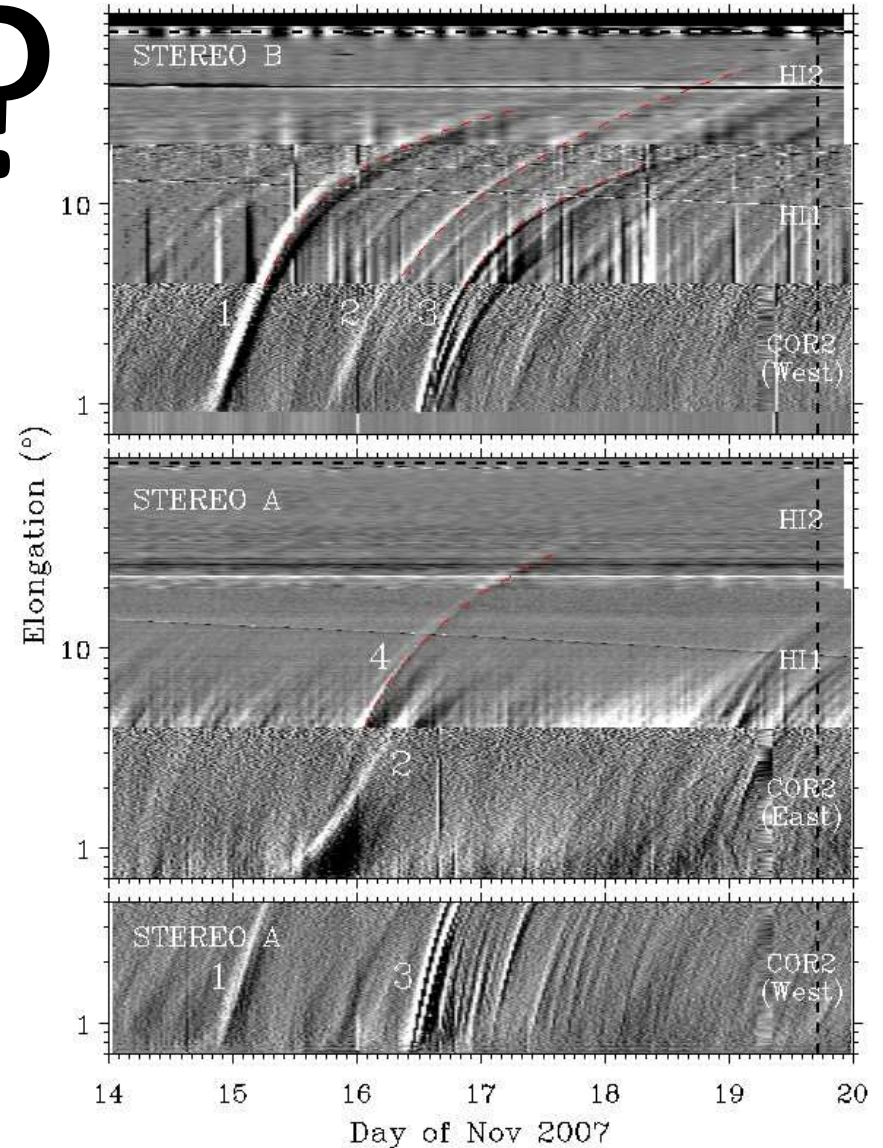
# Solar Stormwatch – motivácia



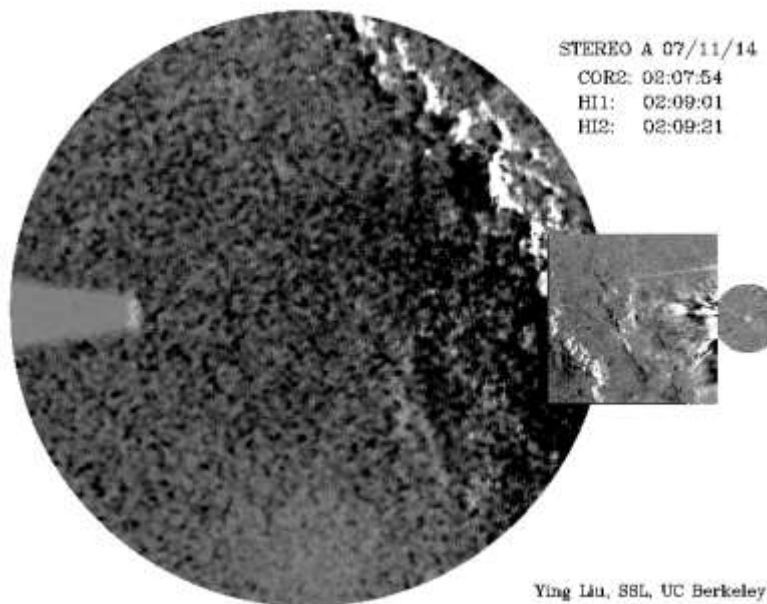
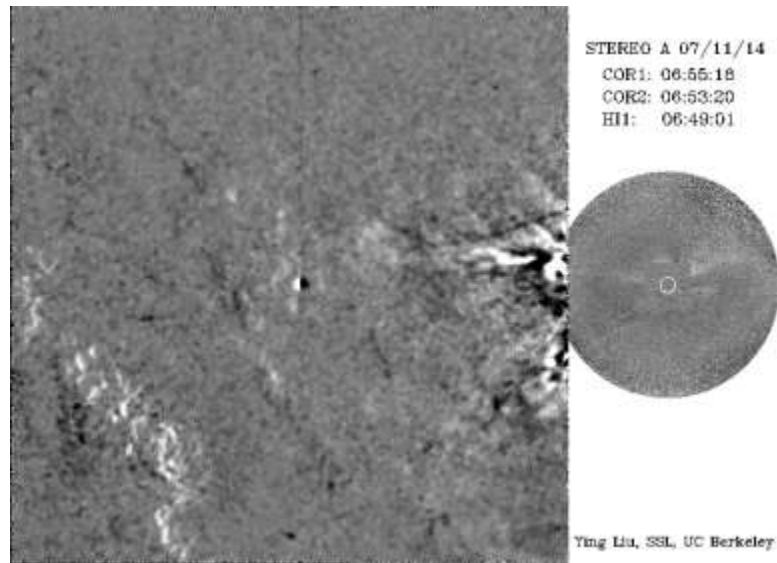
←  
Elongácia

?

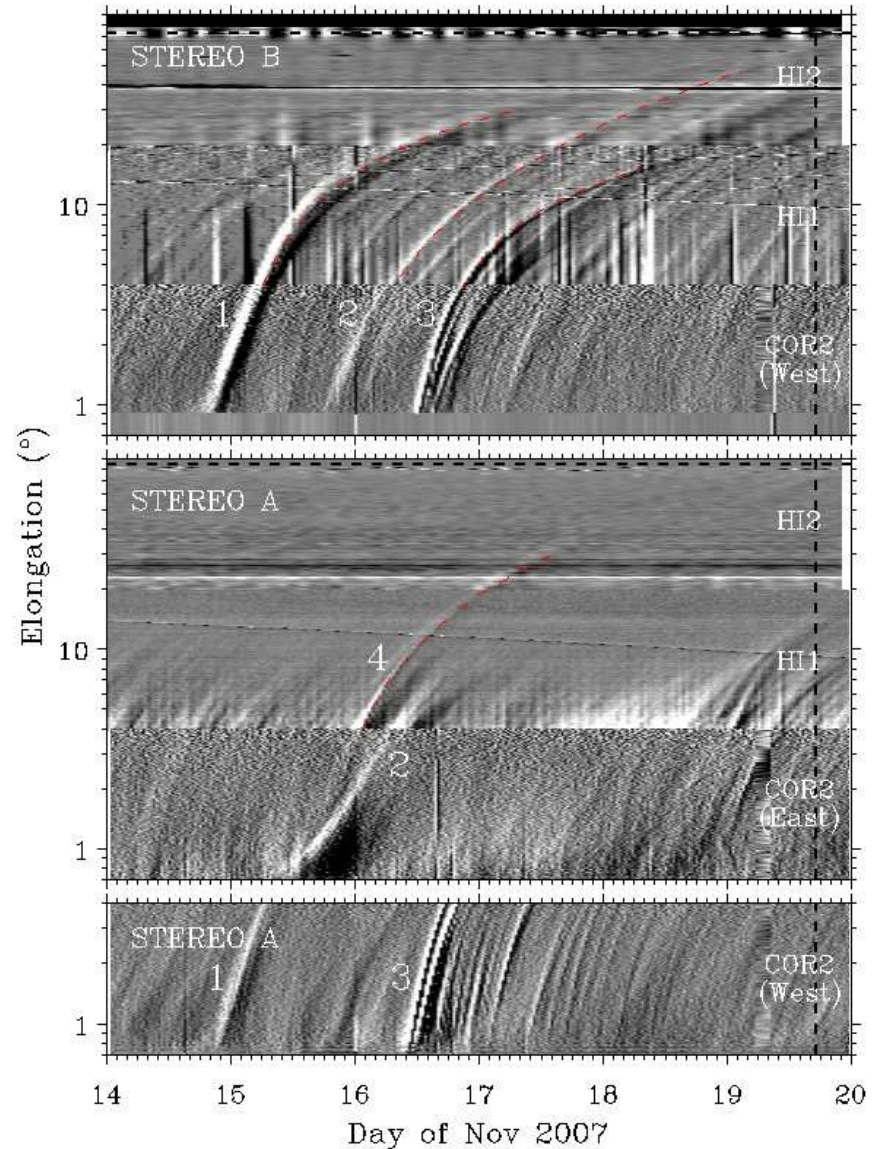
J map (J plot)



# Solar Stormwatch – motivácia



J map (J plot)





# Solar Stormwatch

<http://www.solarstormwatch.com/>

THE ROYAL OBSERVATORY GREENWICH PRESENTS

## SOLAR STORMWATCH

HOME

WHY SCIENTISTS NEED YOU  
MISSION BRIEFING  
SPOT & TRACK STORMS  
TALK ABOUT IT

### Solar scientists need you!

Help them spot explosions on the Sun and track them across space to Earth. Your work will give astronauts an early warning if dangerous solar radiation is headed their way. And you could make a new scientific discovery.

GET STARTED

Log in

Photo credit: NASA/ESA

#### TALK ABOUT IT

Share your discoveries on the forum and Flickr, check out the space weather forecast on Twitter, and read our blog for all the latest news and challenges.

#### Solar Stormwatch blog

**Calling all Solarstormwatchers!** BBC 2 documentary needs your input

'Here Comes The Sun' is special one-off documentary for BBC 2 investigating the nature of the Sun during this period of heightened solar activity - 1...

[READ MORE](#)

**See your data analysed this week!**

Attention Stormwatchers! Remember all that data analysis you've been doing for us? All those storms you've tracked in both archive and real time data...

[READ MORE](#)

#### Space weather forecast

Twitter is currently unavailable

[SOLAR STORMWATCH FORUM](#)

#### Latest Flickr photos



by [Orion](#) by [Orion](#) by [Orion](#)

[SEE MORE PHOTOS](#)

...and the high temperature from the comforts of his pseudo-cave! And... it is actually useful!

#### Achievements



New recruit



Spot trained

#### For teachers

If you're a teacher, we've got all you need to include Solar Stormwatch in your lessons at Key stages 3 and 4.

[TEACHER RESOURCES](#)

# Čo punúka Solar Stormwatch

[http://www.solarstormwatch.com/mission\\_briefing](http://www.solarstormwatch.com/mission_briefing)

## SCREENCASTS: HOW TO SPOT SOLAR STORMS

HOW TO...  
**SPOT A  
SOLAR STORM  
(1)** 3:58

HOW TO...  
**PLAY  
WHAT'S  
THAT?** 3:54

HOW TO...  
**LOOK AT  
REAL-TIME  
DATA** 2:57

HOW TO...  
**PLAY  
TRACE IT** 3:56

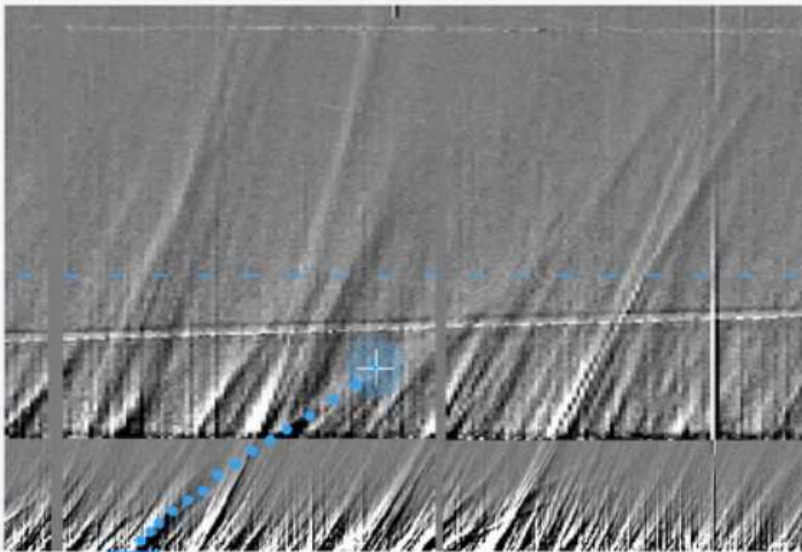
HOW TO...  
**PLAY  
INCOMING —  
TRACE IT** 4:23

HOW TO...  
**PLAY  
TRACK IT  
BACK** 8:31

Log in

## TRACE IT

### J-MAP FROM HELIOSPHERIC IMAGERS 1 AND 2



★ ADD CLIP TO FAVOURITES

MARKS

15/20

MARK



DELETE



SIZE



SHOW/HIDE



RESET



so ident  
that trac

- The line from the slightly!
- If there's estimate place a visible a
- Many of have a : see one NOTHING
- Watch :

## More screencasts

HOW TO...  
**SPOT A  
SOLAR STORM  
(1)** 3:58

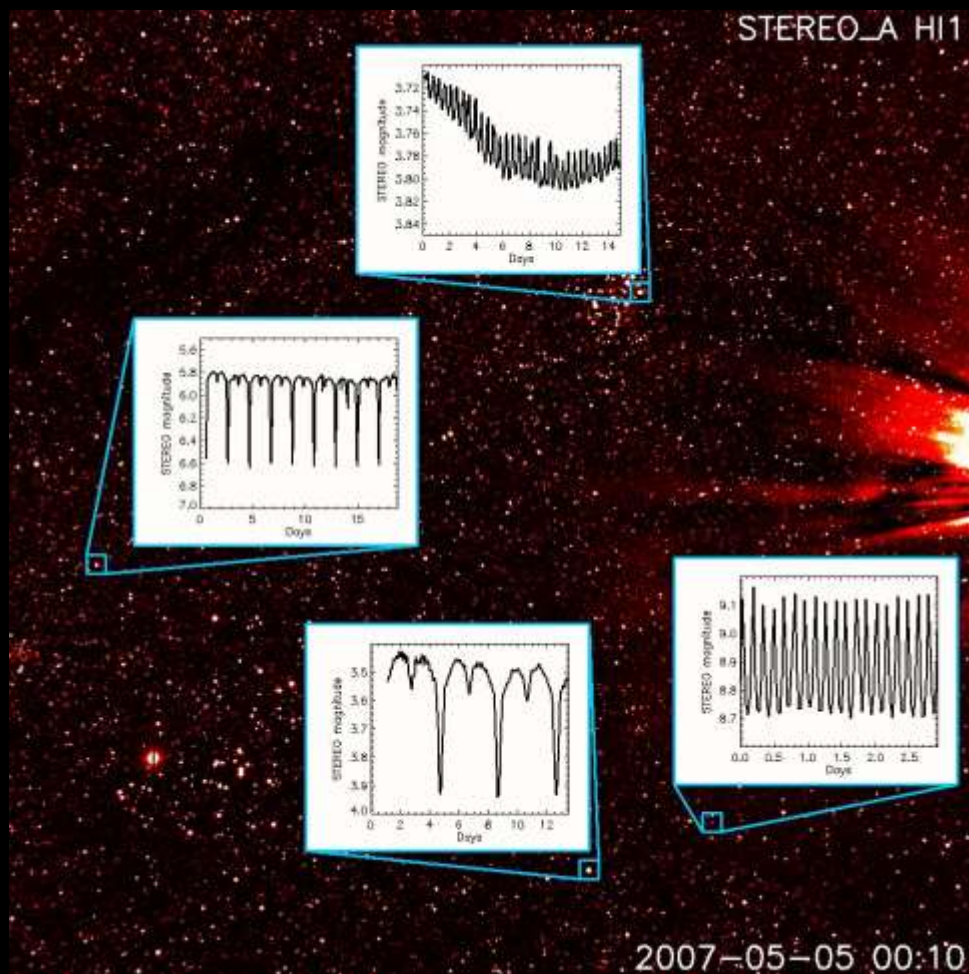
HOW TO...  
**PLAY  
WHAT'S  
THAT?** 3:54

HOW TO...  
**LOOK AT  
REAL-TIME  
DATA** 2:57

HOW TO...  
**PLAY  
TRACE IT** 3:56



# A to nie je všetko



- STEREO premenné hviezdy
- STEREO kométy
- STEREO asteroidy

## Bonus



Archív STEREO dát je otvorený.