



南極からの重力マイクロレンズ観測

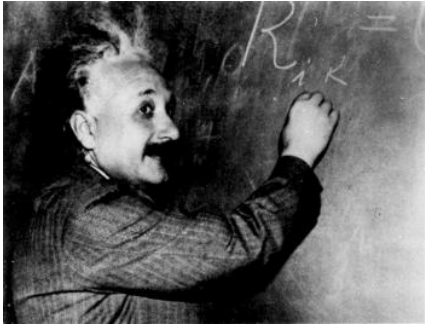
Microlensing observations from Antarctica

阿部 文雄

Fumio Abe

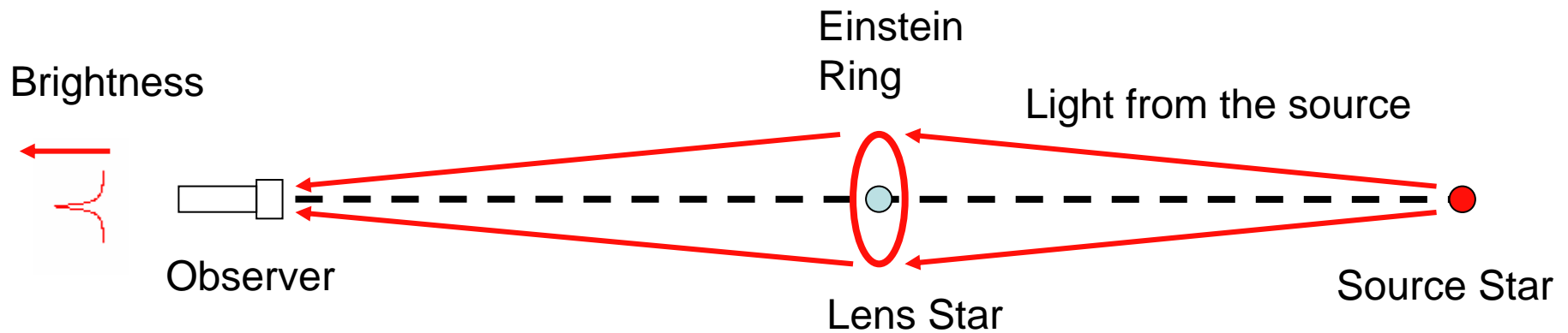
STEL, Nagoya University

MOA Collaboration



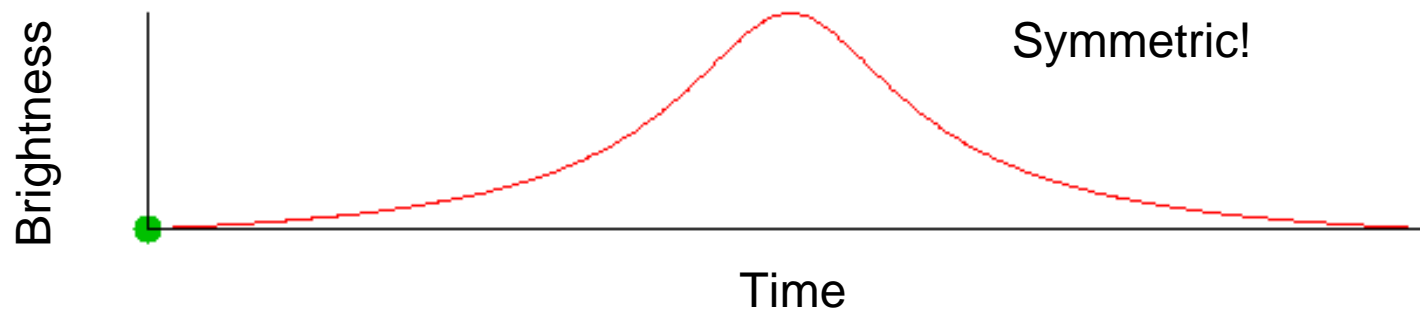
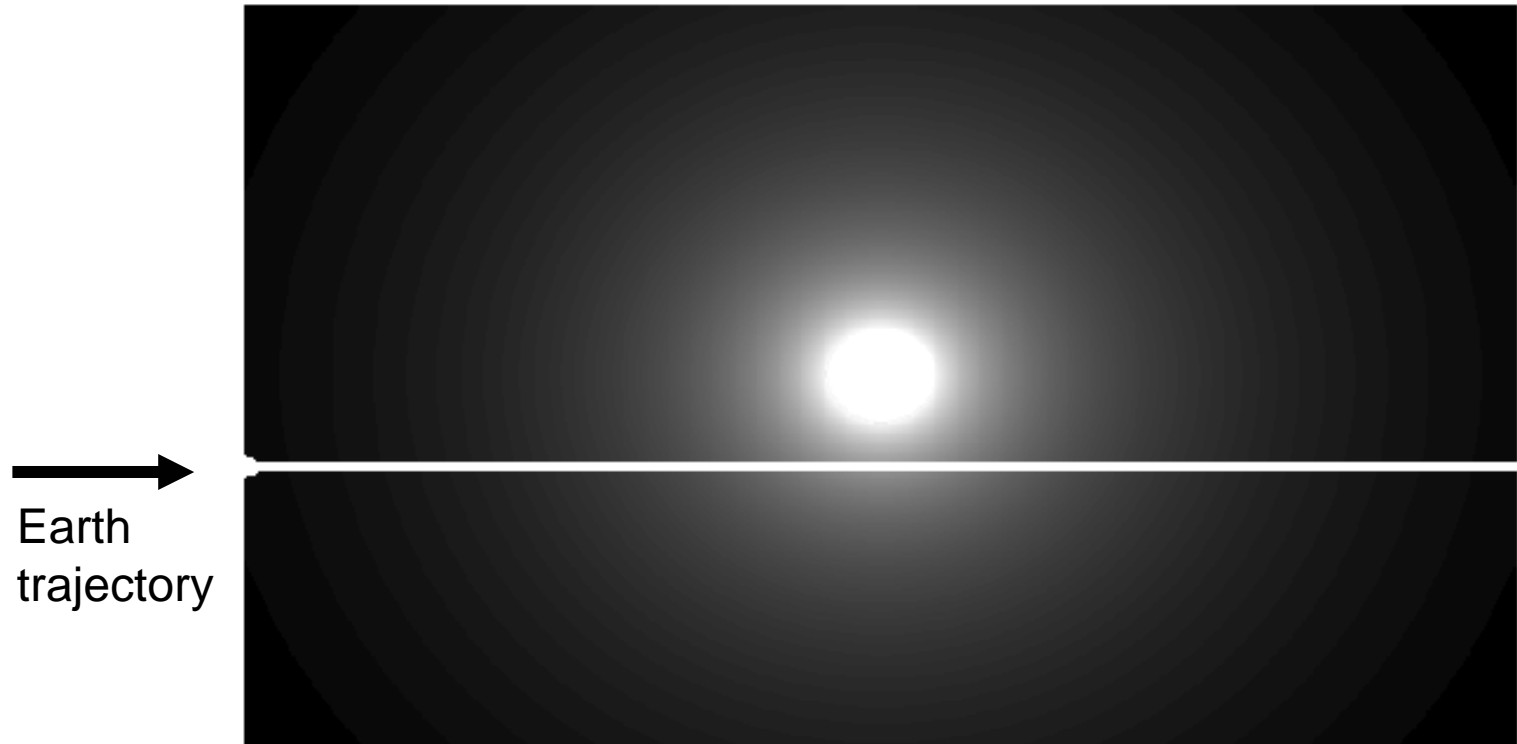
Gravitational Microlensing

- Apparent brightness of the source star is magnified by the lens star

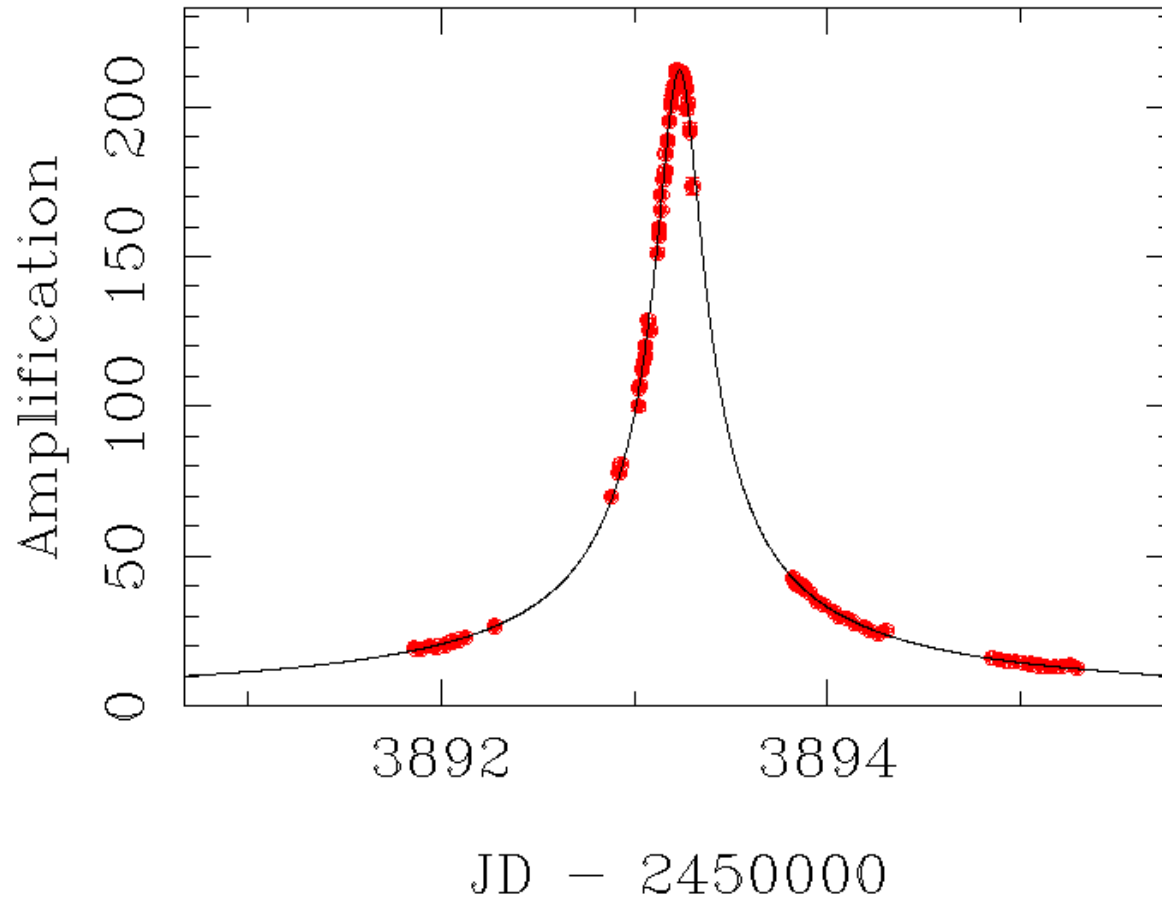


Therefore, there is no great chance of observing this phenomenon, even if dazzling by the light of the much nearer star B is disregarded.
(Einstein, 1936)

Light curve of a single-lens event



Observed single lens event



Now we are observing ~
several 100 events/year
(mostly in Galactic
bulge)

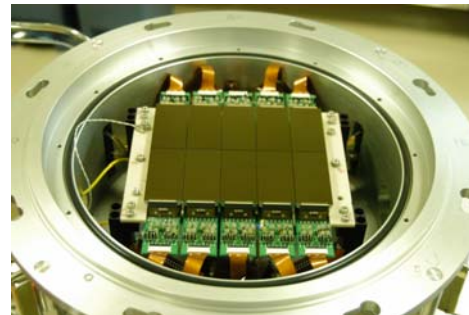
Typical timescale :
several 10 days

MOA II Project

(Japan-New Zealand collaboration)



1.8m telescope
Observing
Galactic bulge
and Magellanic
Cloud

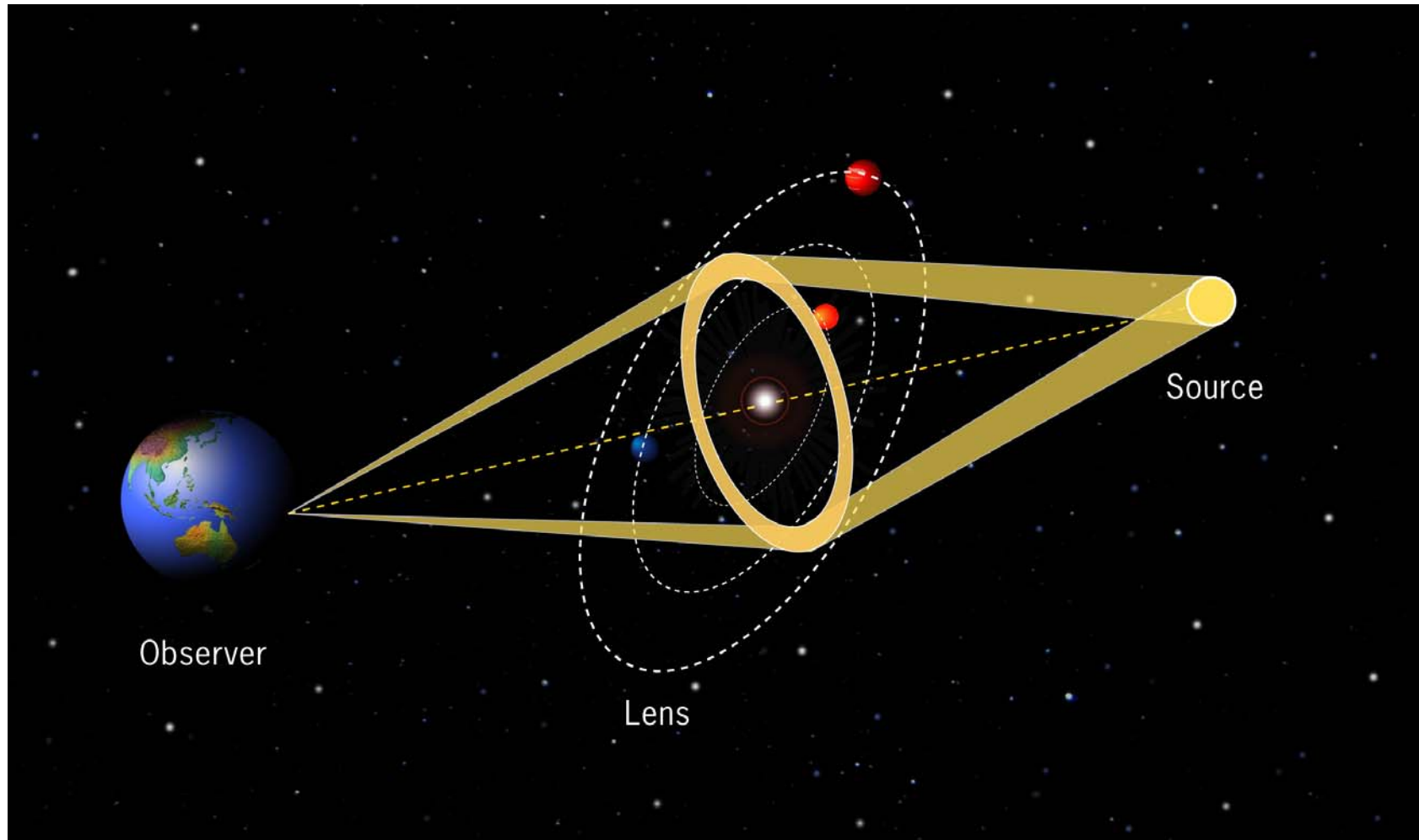


CCD camera
(10 2k X 4k chips)
2.18 deg.²

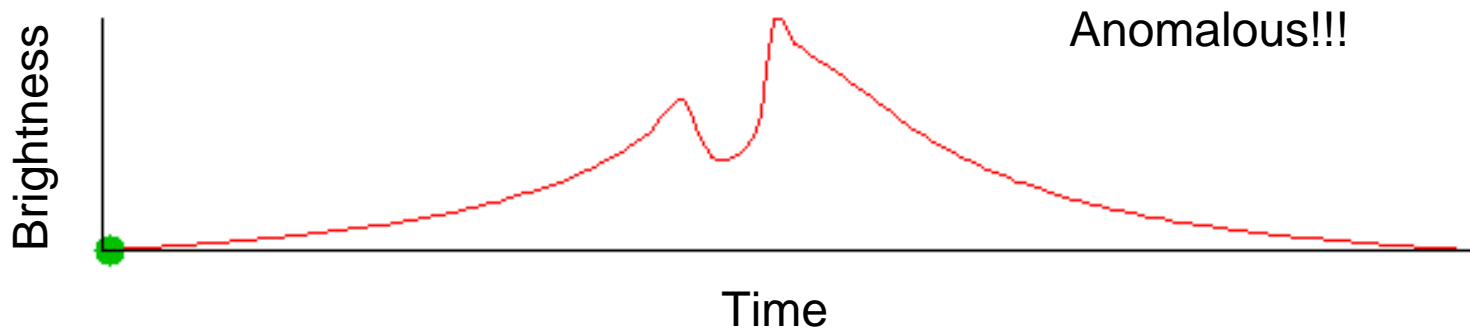
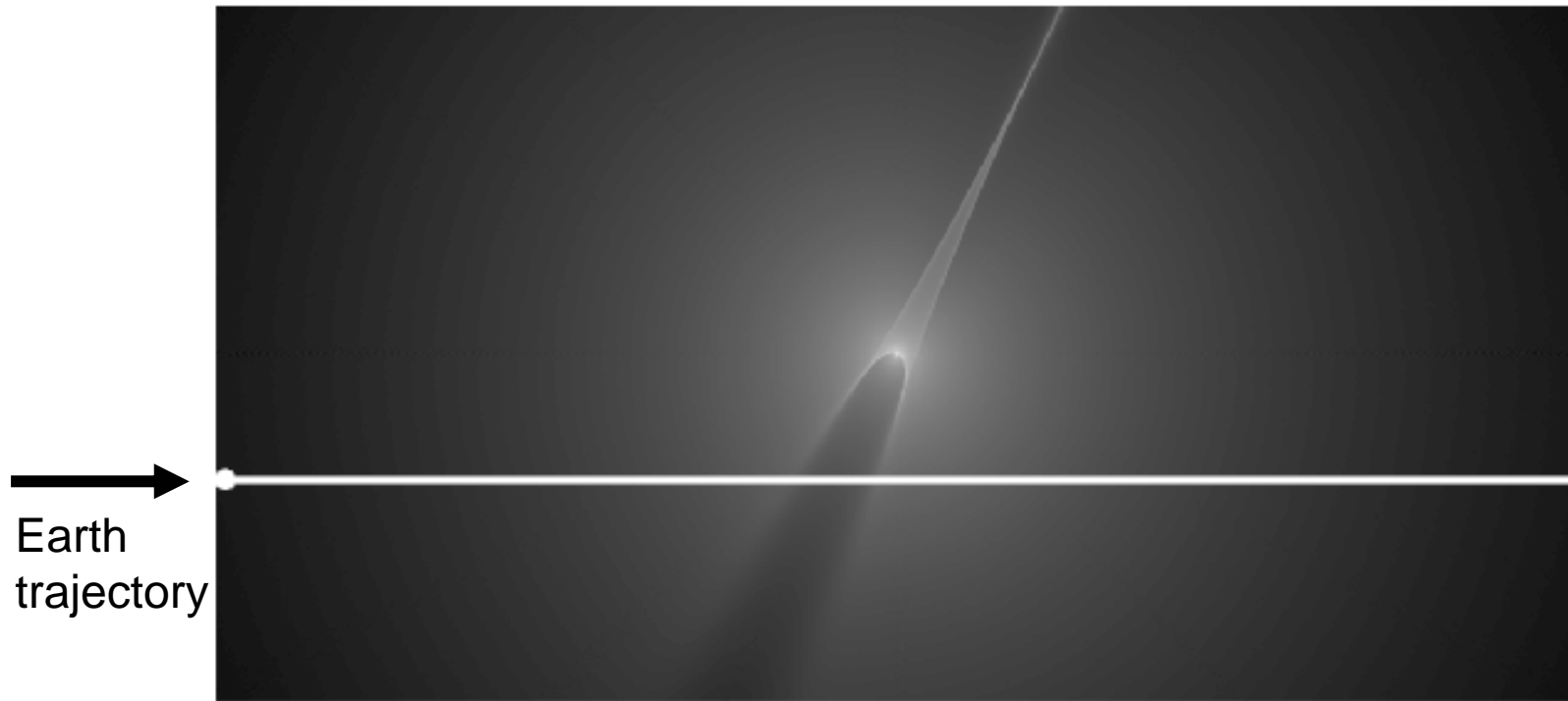
Installed in Mt. John Observatory(2004)
43° 59'S Southernmost Observatory in the
world (**except Antarctica**)
>13 hour bulge observation/day (in winter)
Best site for bulge and Magellanic Clouds



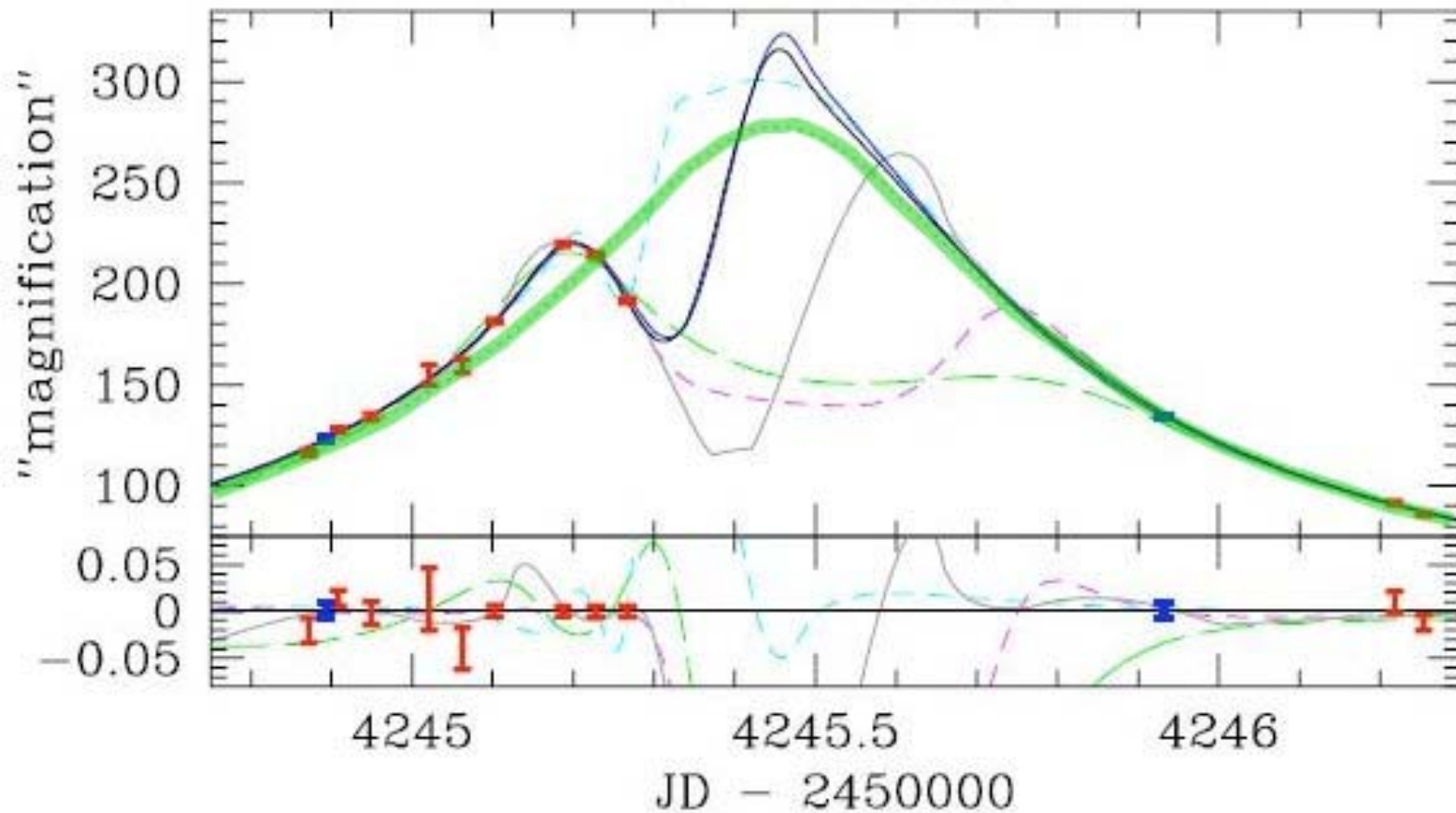
Microlensing planet search



Light curve of a host star and a planet



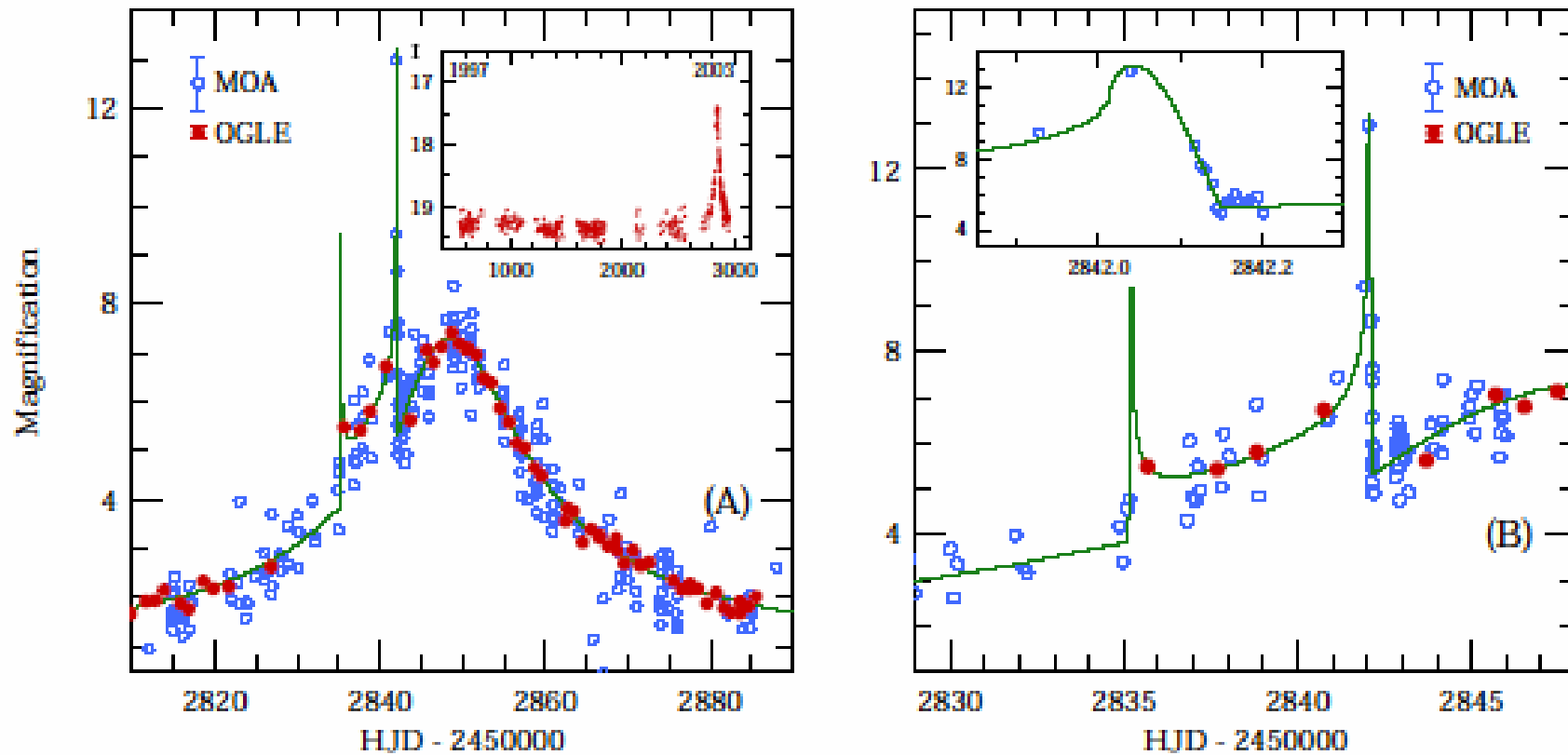
Planetary microlensing event MOA 2007-BLG-192



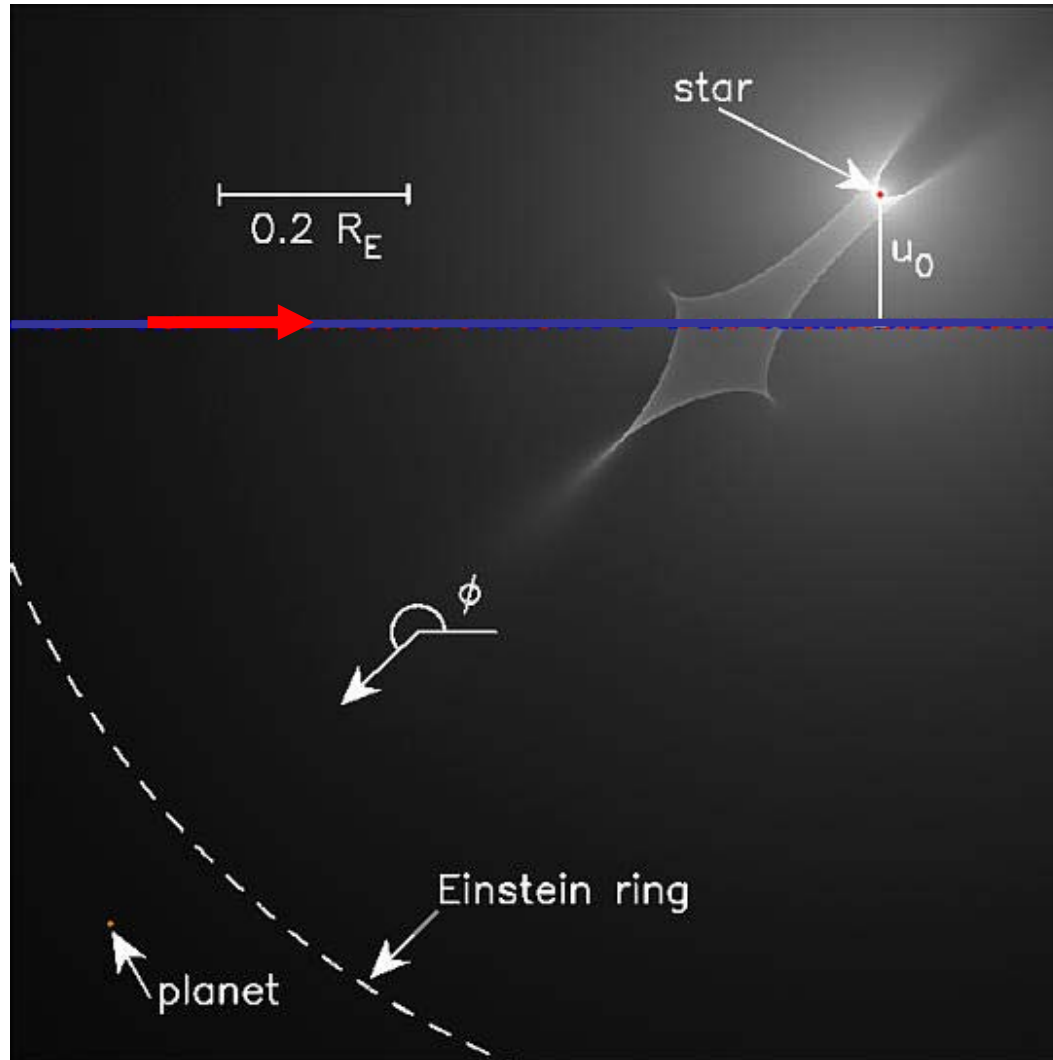
Bennett et al., 2008

First planet discovered with microlensing

OGLE-2003-BLG-235/MOA-2003-BLG-53

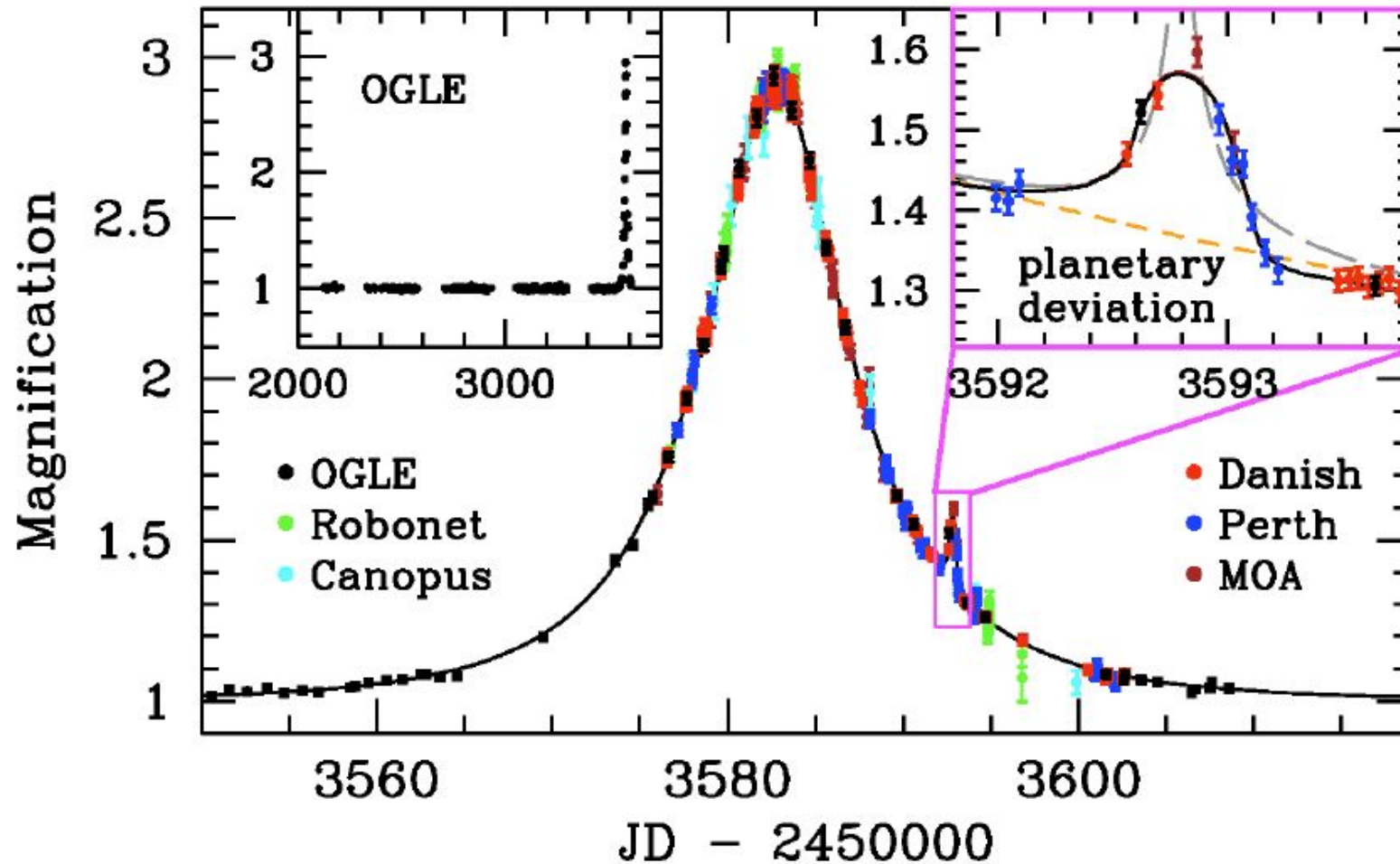


Bond et al., ApJ 606, L155,2004



$q=0.0039$
 $d=1.120$

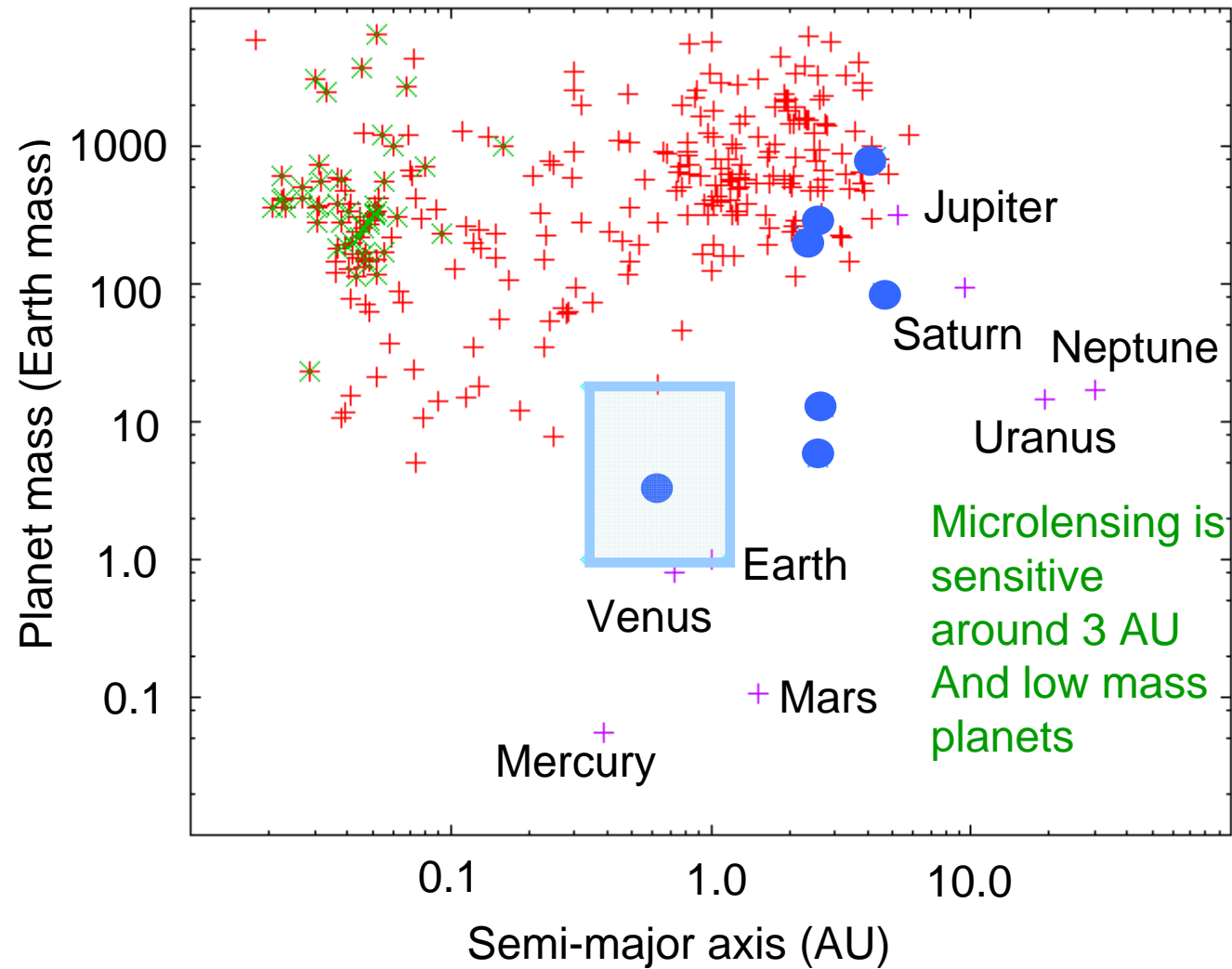
Discovery of 5.5 Earth mass planet



OGLE 2005-BLG-390

Beaulieu et al., 2006

Distribution of planets



Major microlensing observation groups



OGLE

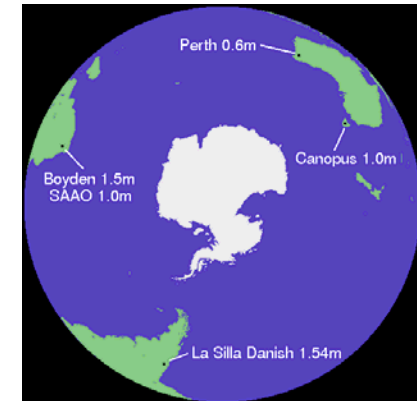


MOA

Event survey



MicroFUN



RoboNet-1.0



Event alerts

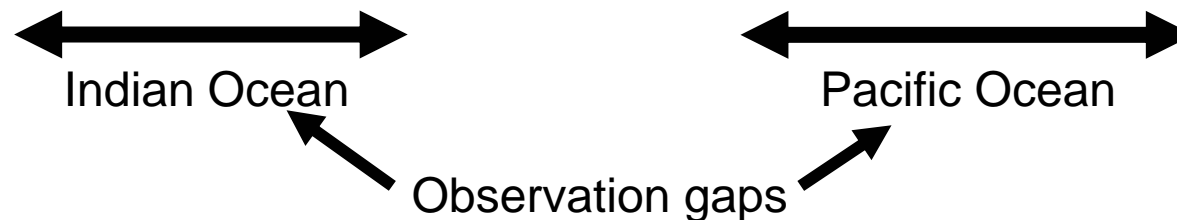
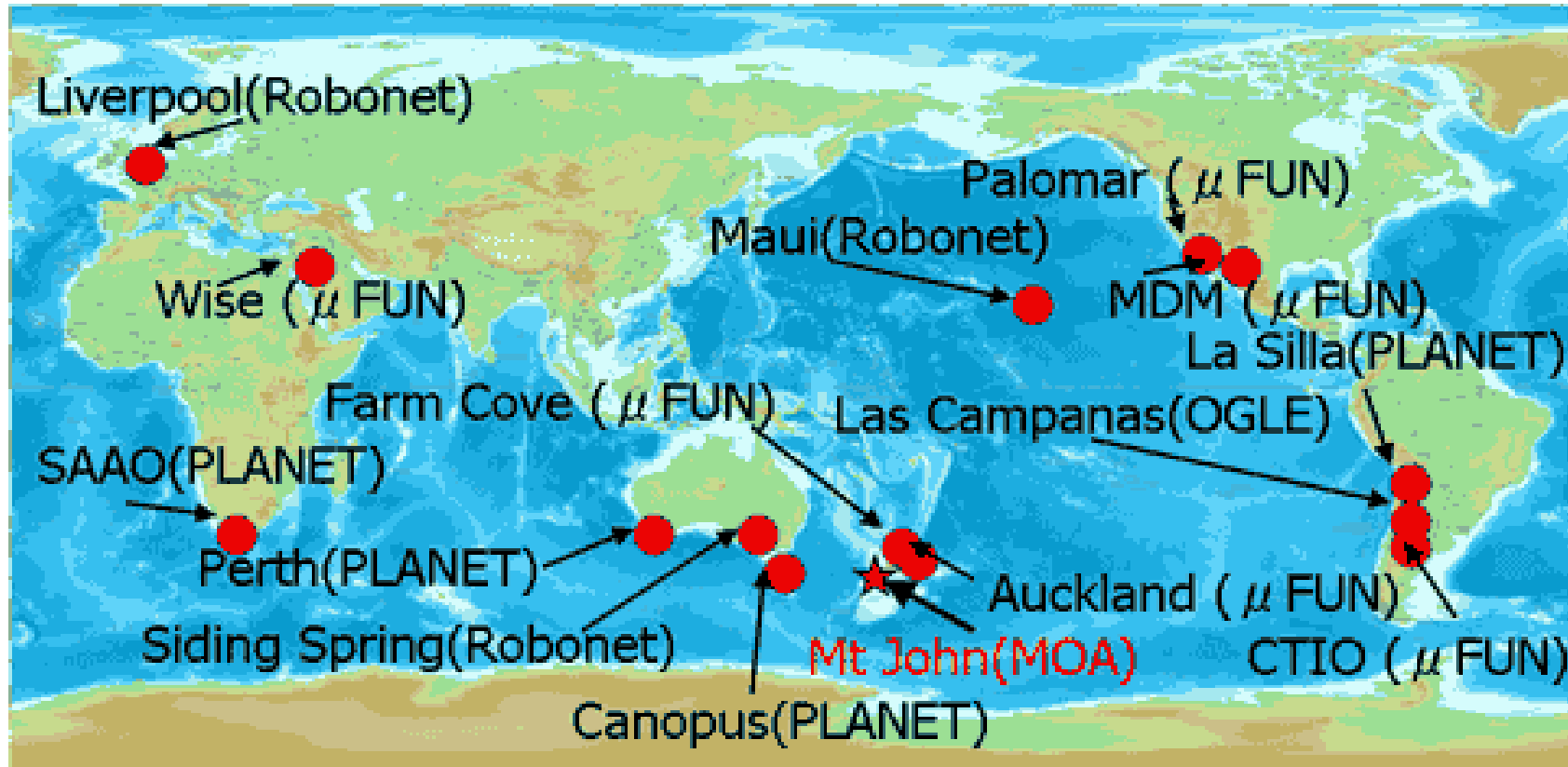
Anomaly alerts
High magnification alert

PLANET/Robonet

Follow up

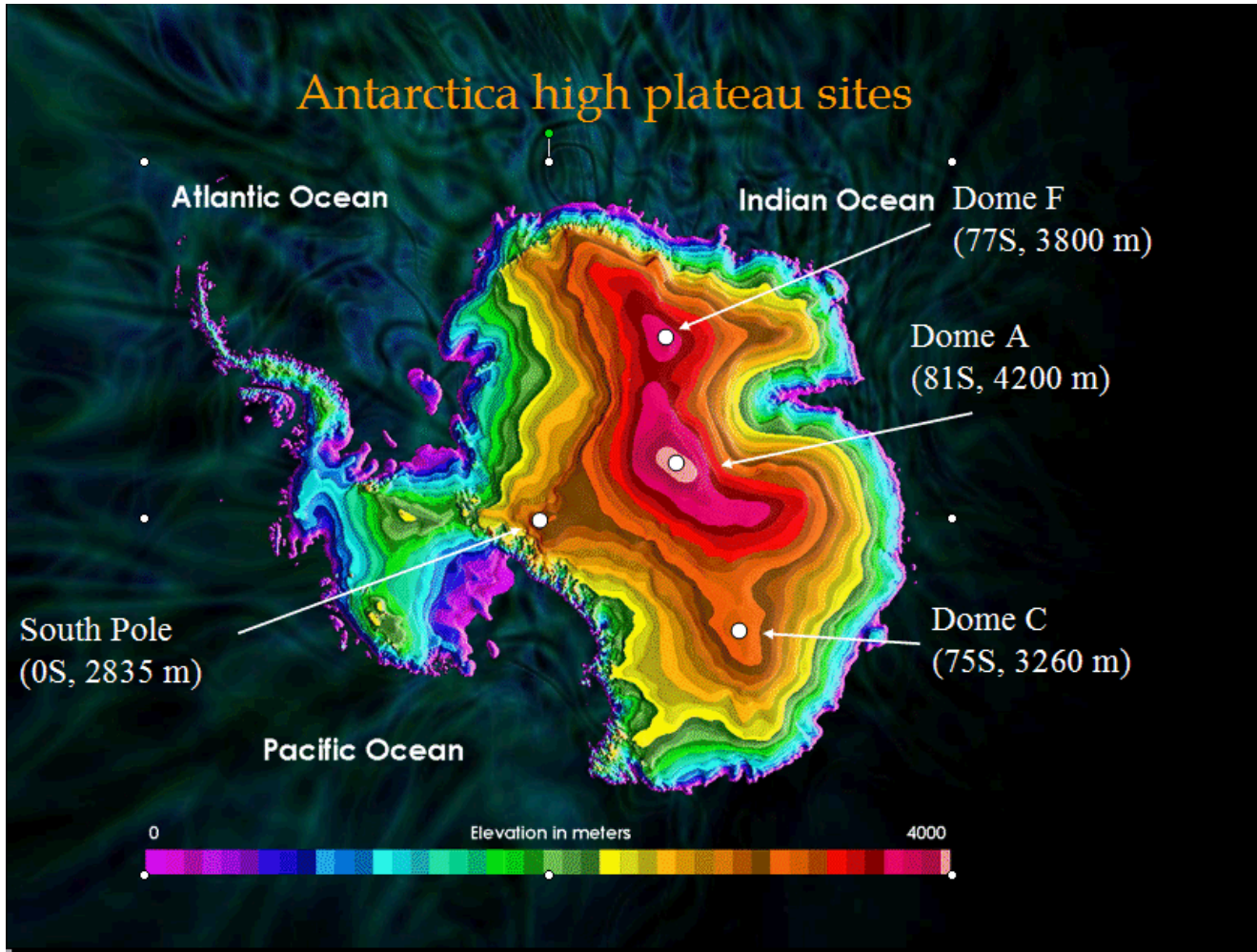
Collaboration in observations

- An empire under Galactic bulge -



Plateau of Antarctica:

Best observation site for microlensing planet search?

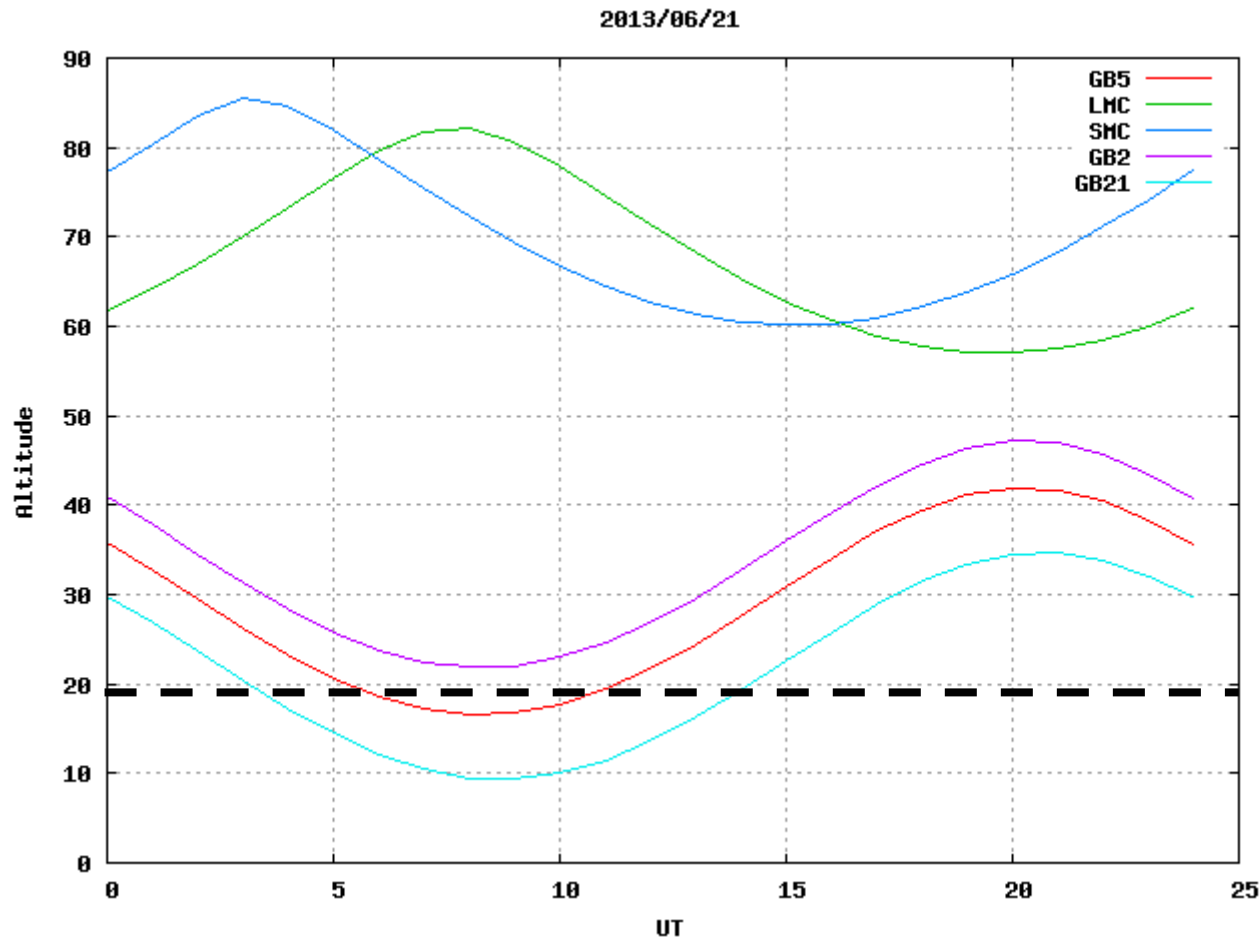


Good weather
High transparency
Good seeing
Polar night

Low temperature

Is 24 hour observation possible?

Dome F



Good for LMC
and SMC
observations



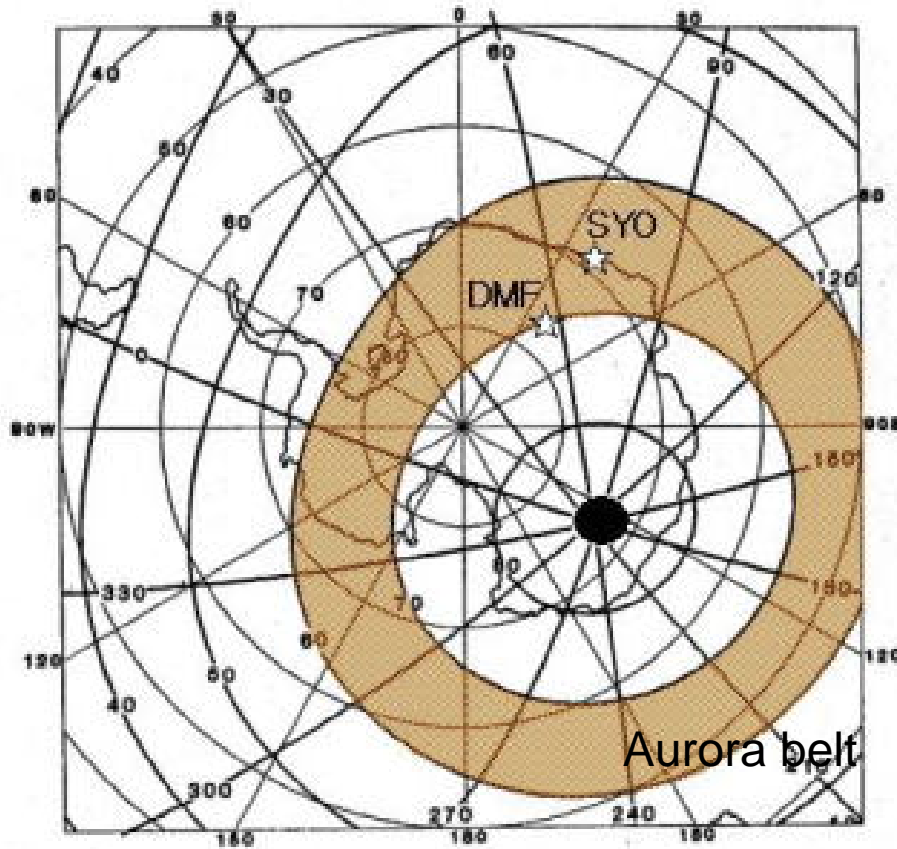
24 hour
observation
is limited to
only a few fields



We prefer South Pole. But Dome F is still better in observation time than New Zealand

Aurora background

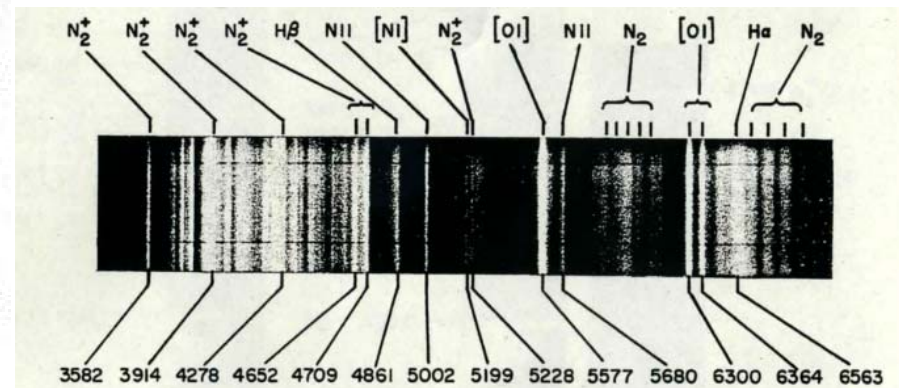
地磁気の座標とオーロラ帯



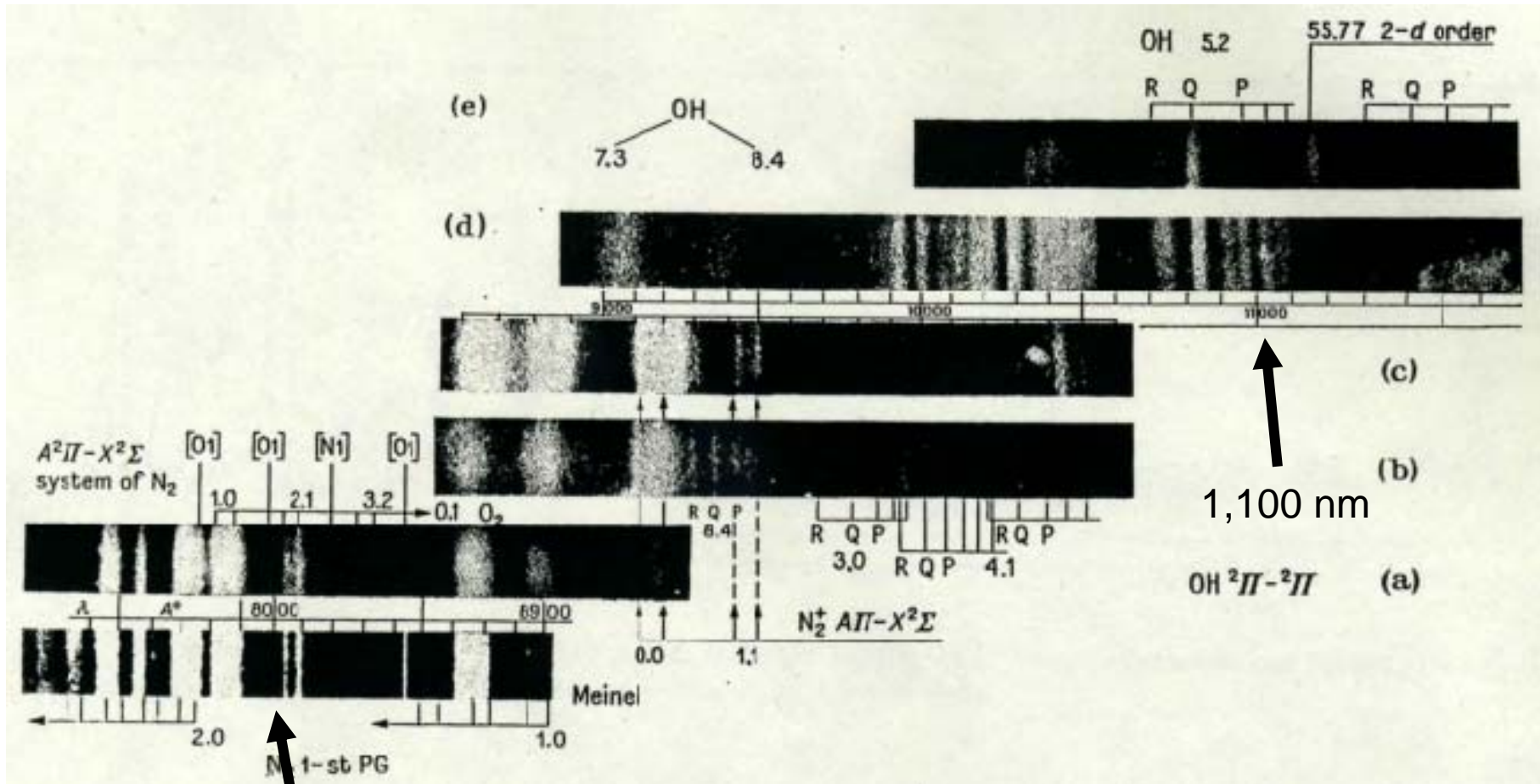
Dome F is at the edge of
Aurora belt

Probably Dome C is
better

There are strong
emission lines from UV to
IR (~ 1200 nm)

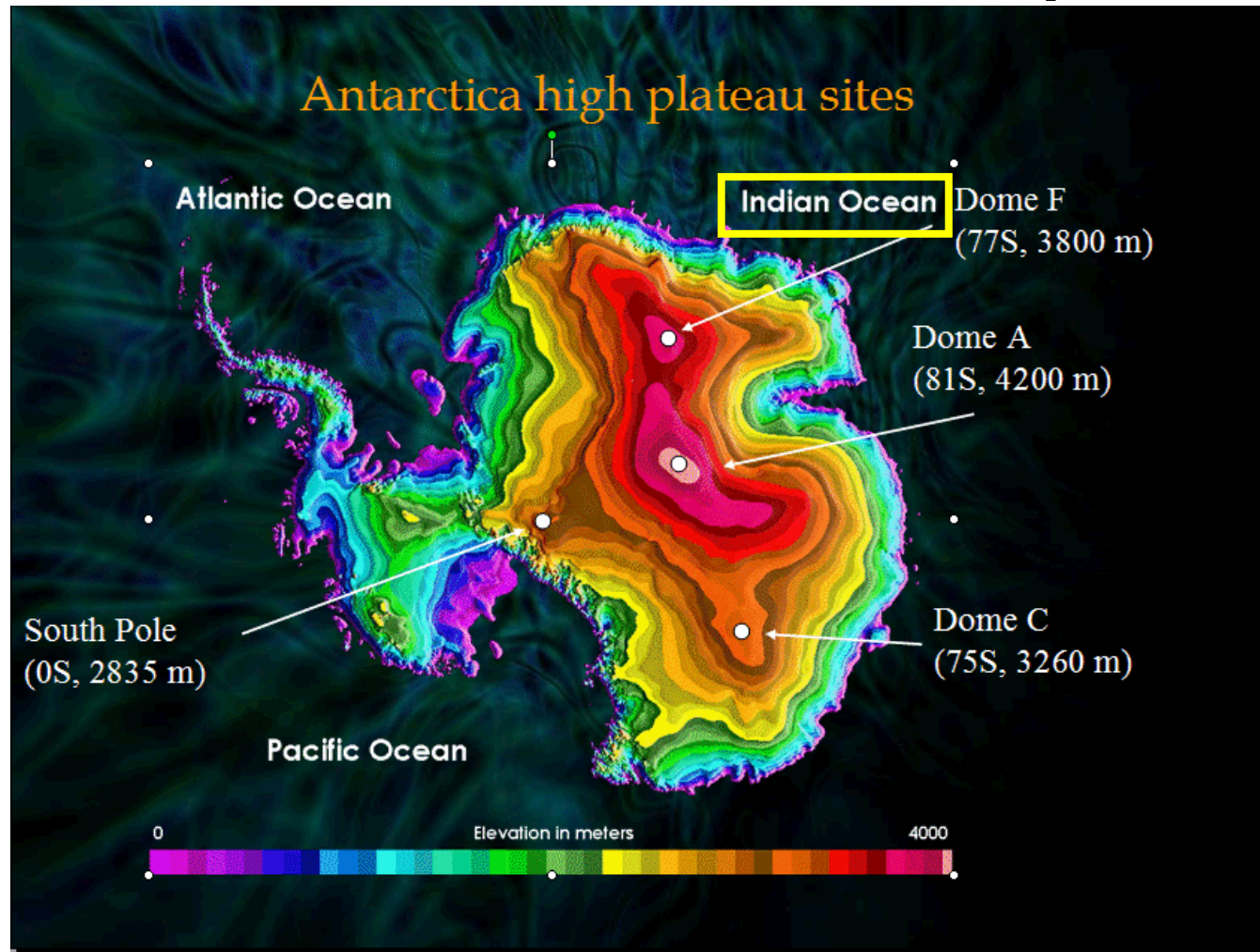


IR spectra of aurora



800 nm

Dome F as a follow-up site



Longitude of Dome F corresponds to the gap in the Indian Ocean!!!
Good site for follow-up observation

Summary

- We are evaluating Dome F, Dome A, Dome C, and South Pole for future microlensing survey
- At present, South Pole seems to be best because 24 hour observation can be made
- Other sites especially Dome F can be potential follow-up observation site to cover gaps of ocean