

Some stories from a former EROS PHD student

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« You will never discover microlensing events, and even if you see variability, you will never know what it is. It is a complete waste of money and time !
It is irresponsible !»

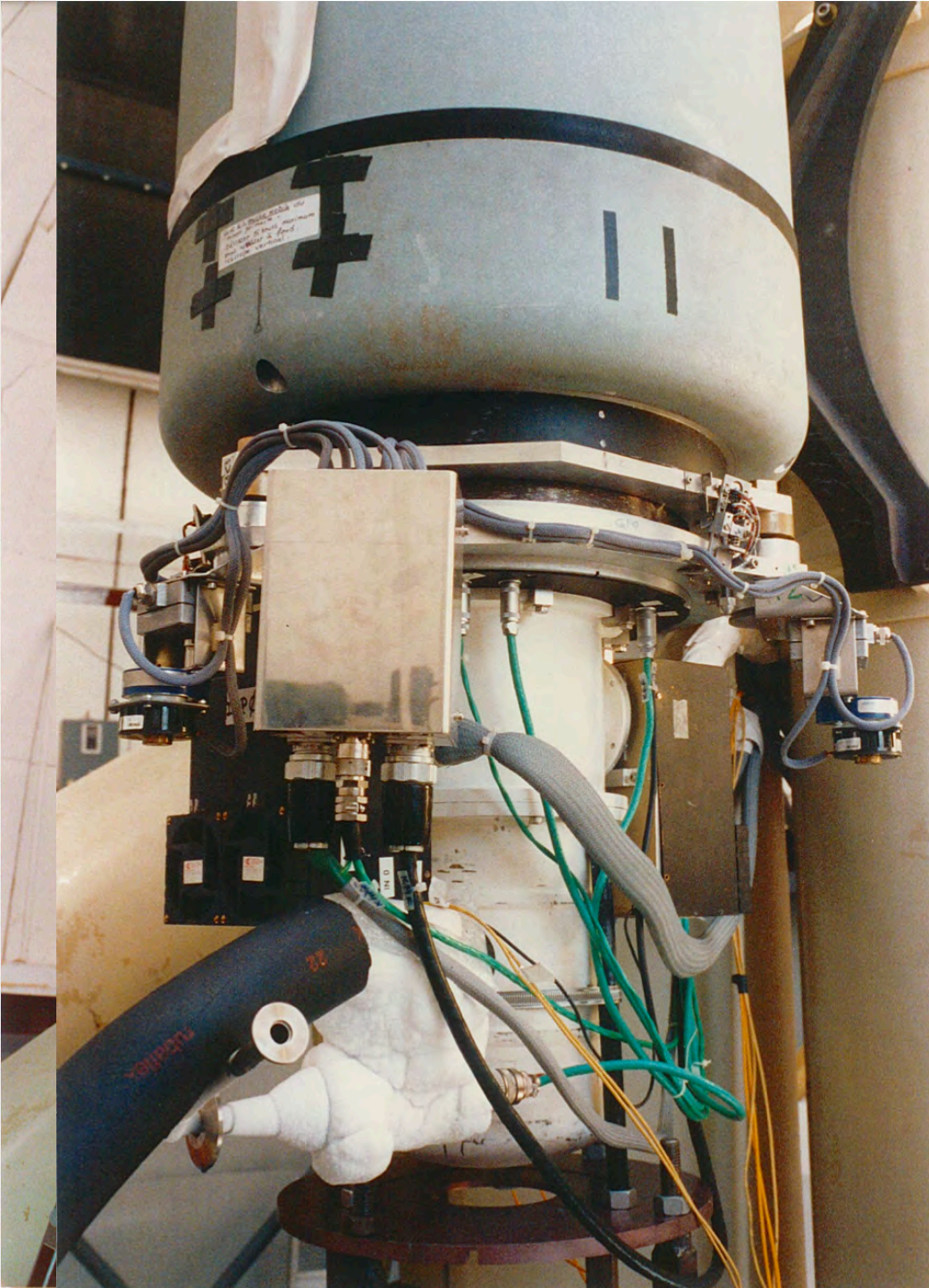
A professor patronising a starting PHD student in September 1992

Lots of observations from Chile
Working with particle physicists (CEA, IN2P3)
Seemed to be attractive to Nerds with taste for signal processing
Dark matter ? Variable stars ?

Anyway, I do a PhD for fun, then I'll get a normal job.







Observing for 2-4 weeks in a row

Climb the ladder

Fill up the Liquid Nitrogen (defrosting using hair drier)

Pointing by hand, checking level, pressing buttons in the dome

Receive visit from other telescopes at sunset, when cloudy
Have a pisco sour

Rotating the dome every 30-45 min

If cloudy night, transform the dome in a tango dance floor
Organise a swiss cheese fondue
Organise a pancake party
Christmass decoration on telescope

After 3 weeks:

Climb the ladder to take night photos in the dome

Regret not to have a gun to shoot the observer with you, who is rehearsing his latest opera song...

Time to go back to civilisation



Pisco y astronomia de qualidad







Art performance in La Silla

Good old Nerd-days,

Need to develop most tools from scratch

Enormous dataset, limited power



Friendly VI editor on VT100 to write code in C to read your data

```
{
SUIVIFIP *sfip;
char *po;
char fiac[20];

if ((po=(char *)malloc(sizeof(SUIVIFIP)+strlen(filename)+1)) == NULL)
{ printf(" SuiviOpen_Erreur : Pb malloc \n"); return(NULL); }
sfip = (SUIVIFIP *)po;
sfip->Nom = po+sizeof(SUIVIFIP);

if ( rw == SUOF_RW ) { strcpy(fiac,"r+"); sfip->FgRW = SUOF_RW ; }
else { strcpy(fiac,"r"); sfip->FgRW = SUOF_RO ; }

#ifdef IBM
strcat(fiac,"b");
#endif

/* Ouverture fichier */
if ( (sfip->fip = fopen(filename,fiac)) == NULL )
{ printf(" SuiviOpen_Erreur : Pb fopen(%s) \n",filename); free(po); return(NULL); }

:w
```



EROS astrometry 1994, based on the 1908 (x,y) Harvard system

PLATE XVII



HENRIETTA SWAN LEAVITT
At about 30 years of age.

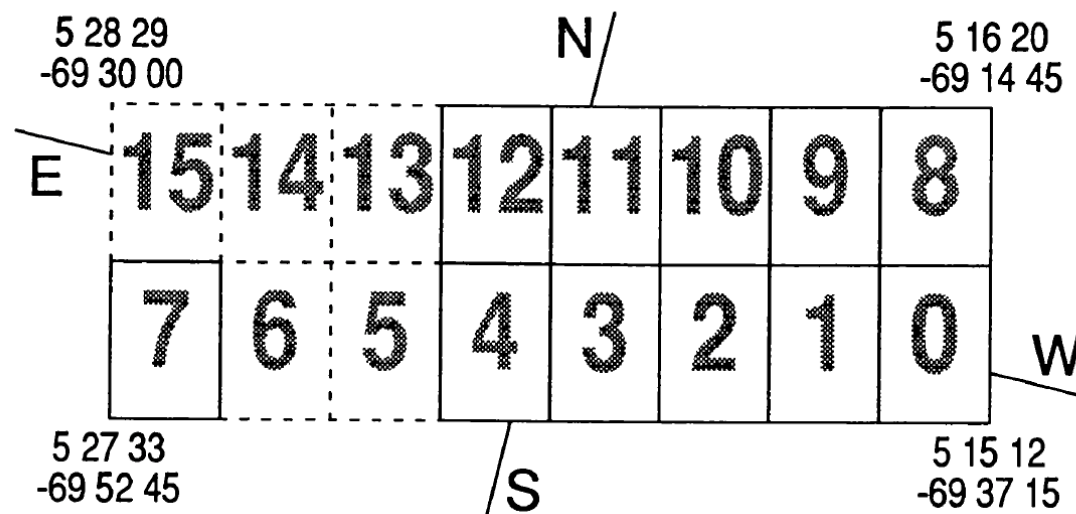
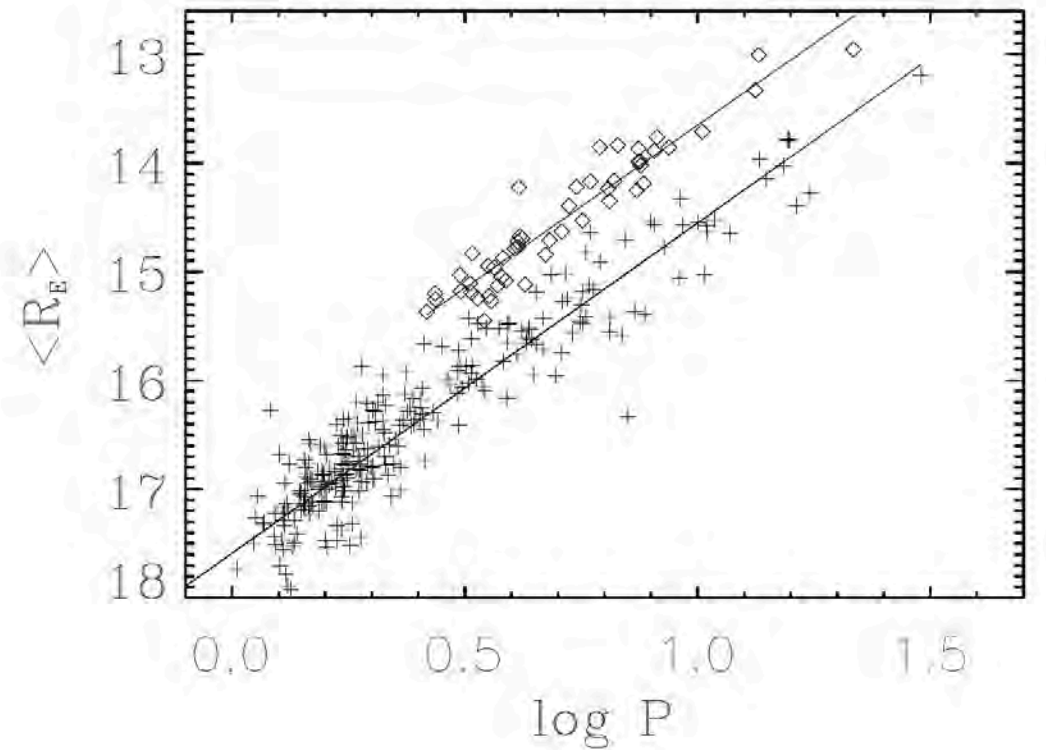
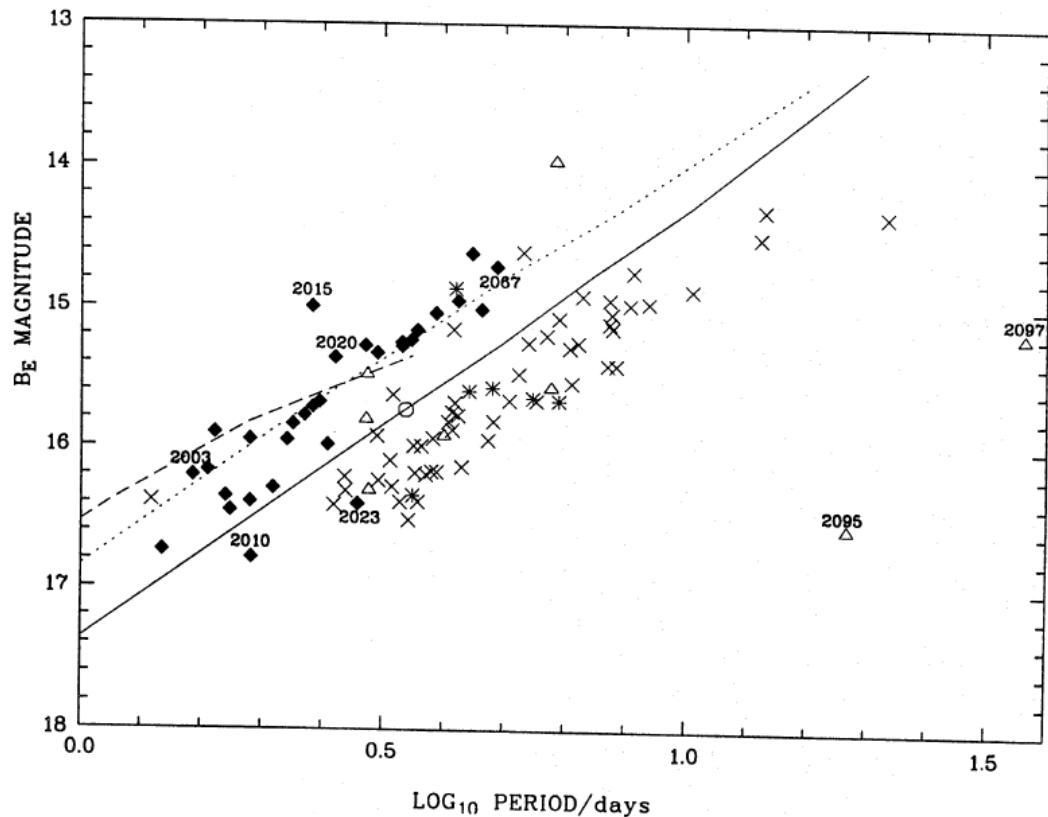


Fig. 1. The arrangement and numbering of the CCDs in the EROS camera used for observations of the LMC bar. Data were unavailable from CCDs outlined with dashes. Approximate J2000 positions are shown for the corners of the mosaic. Corresponding Harvard (x, y) coordinates for the NW, NE, SE and SW corners are (9310,9225), (13215,8440), (12935,7065) and (9030,7850) respectively

Leavitt 1908, Shapley & Mohr 1940, Hodge & Wright 1967

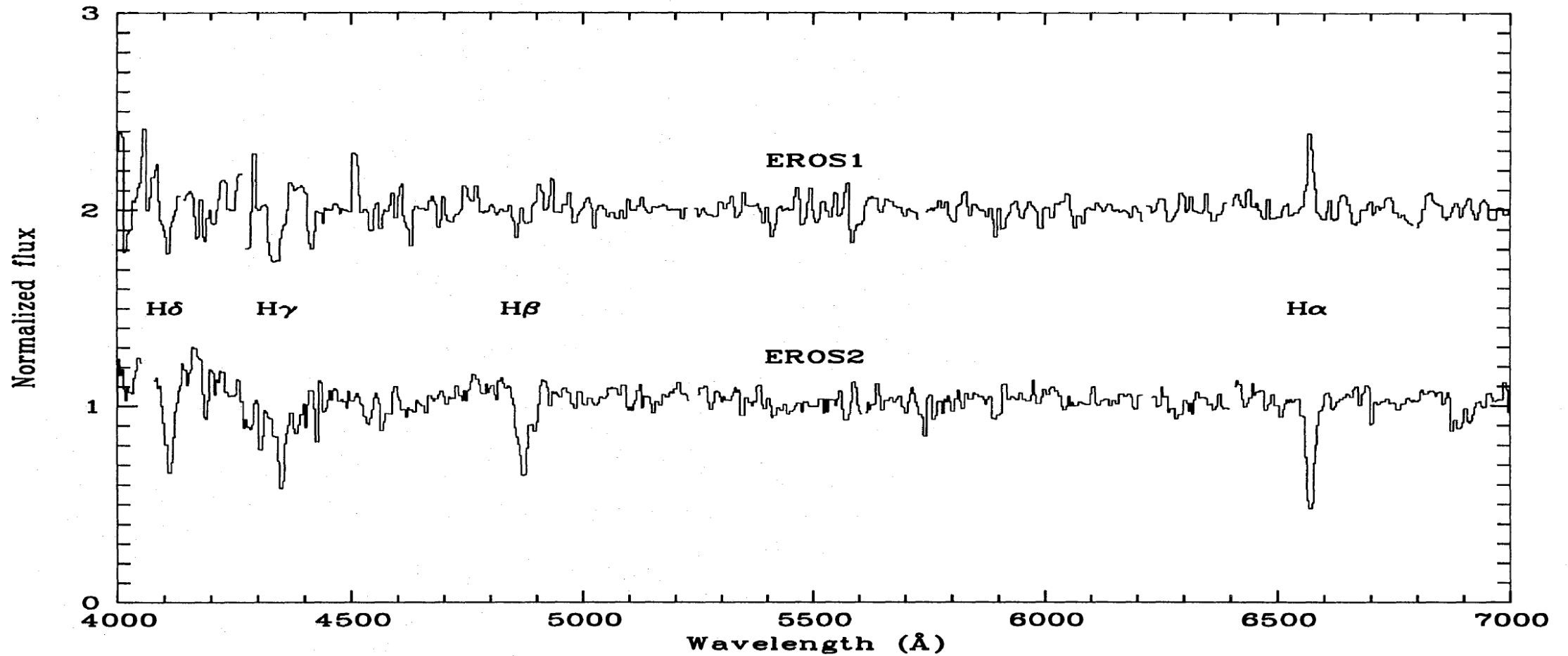
Cepheids in LMC, SMC

Pulsating in different modes, double modes, effect of metallicity on pulsation and distance scale

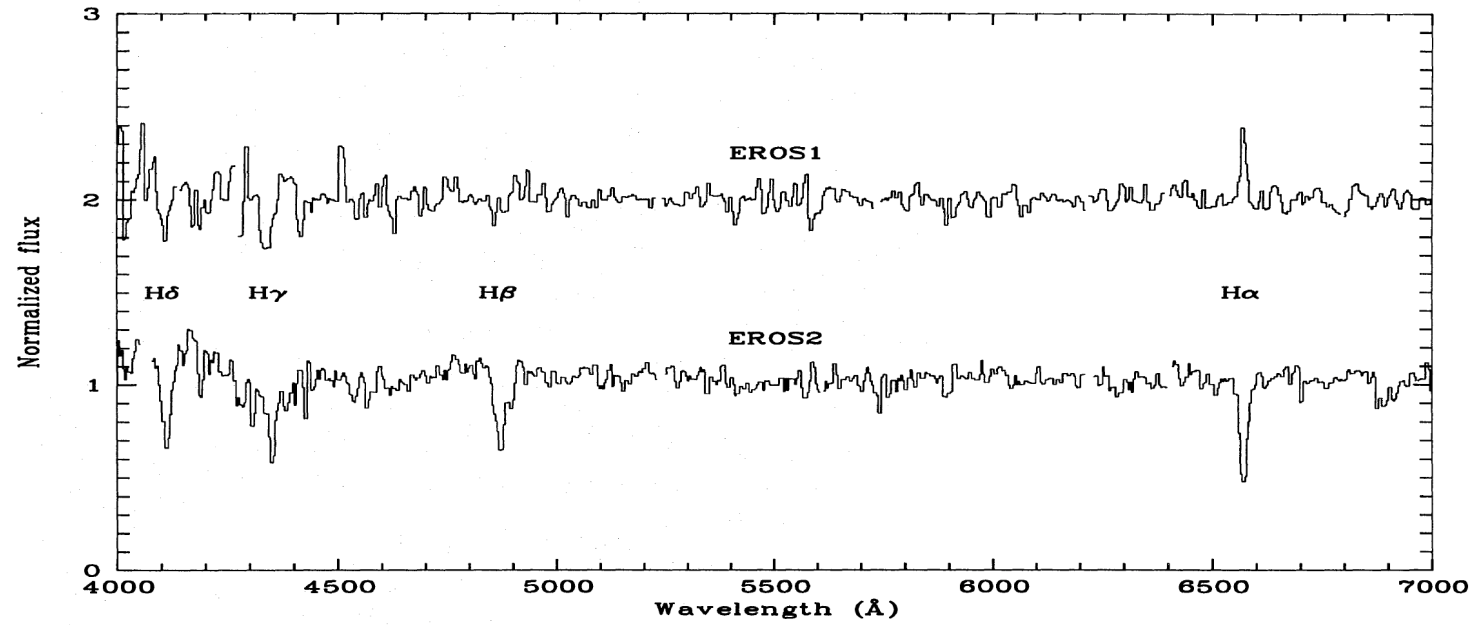


Beaulieu+1995, 1997a, 1997b, Sasselov+1997, then Marquette+2008, 2009

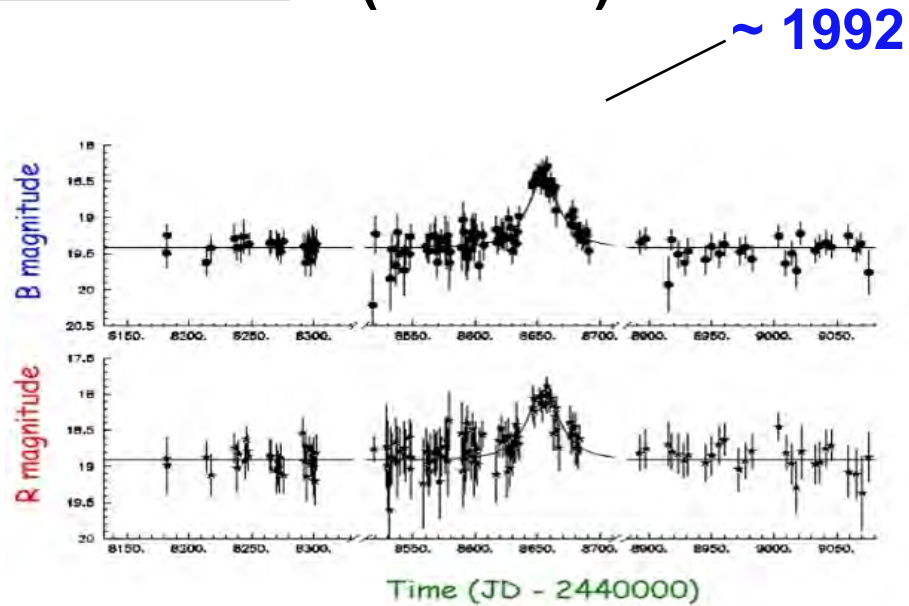
The first two EROS microlensing candidates



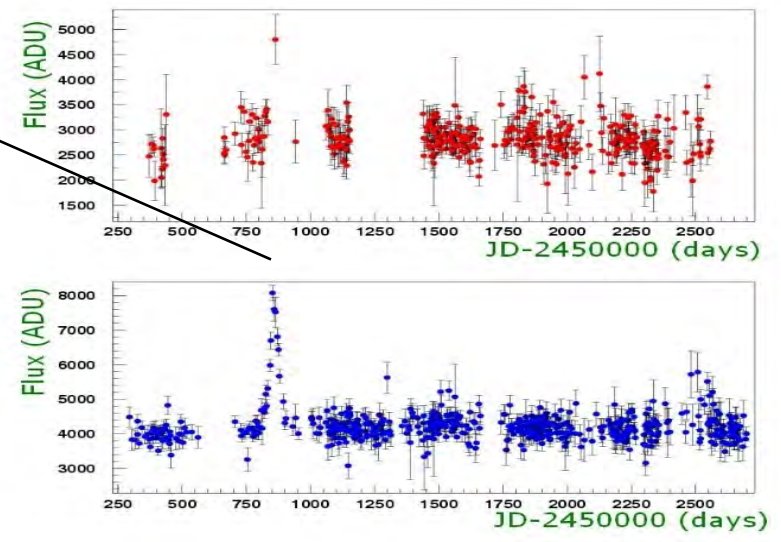
EROS1-Blue bumper...



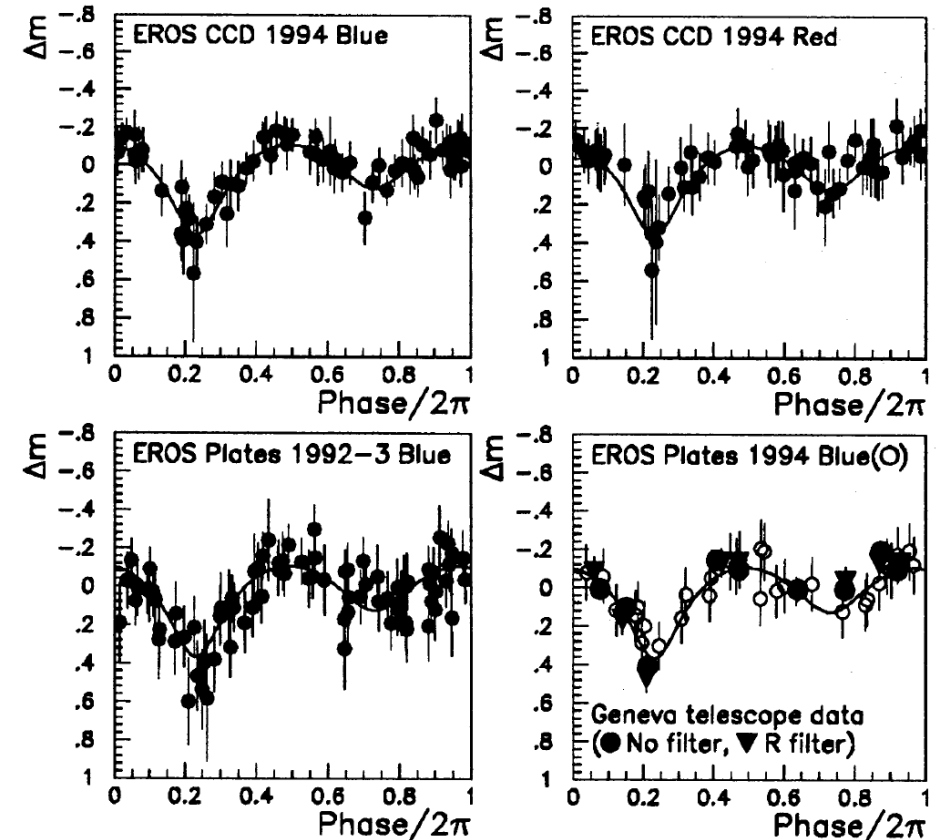
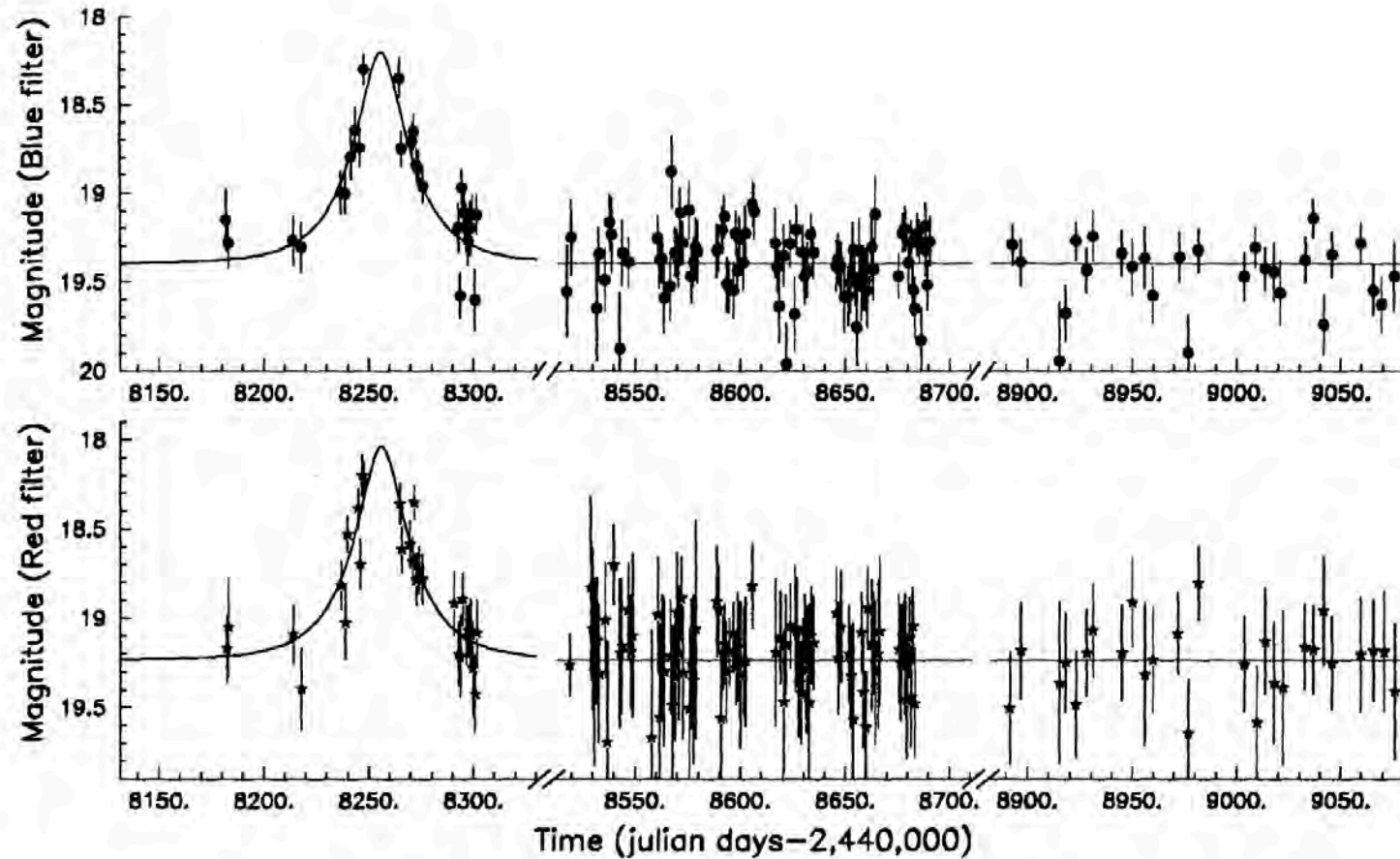
EROS 1 – LMC#1 : (Be star)



~ 1997

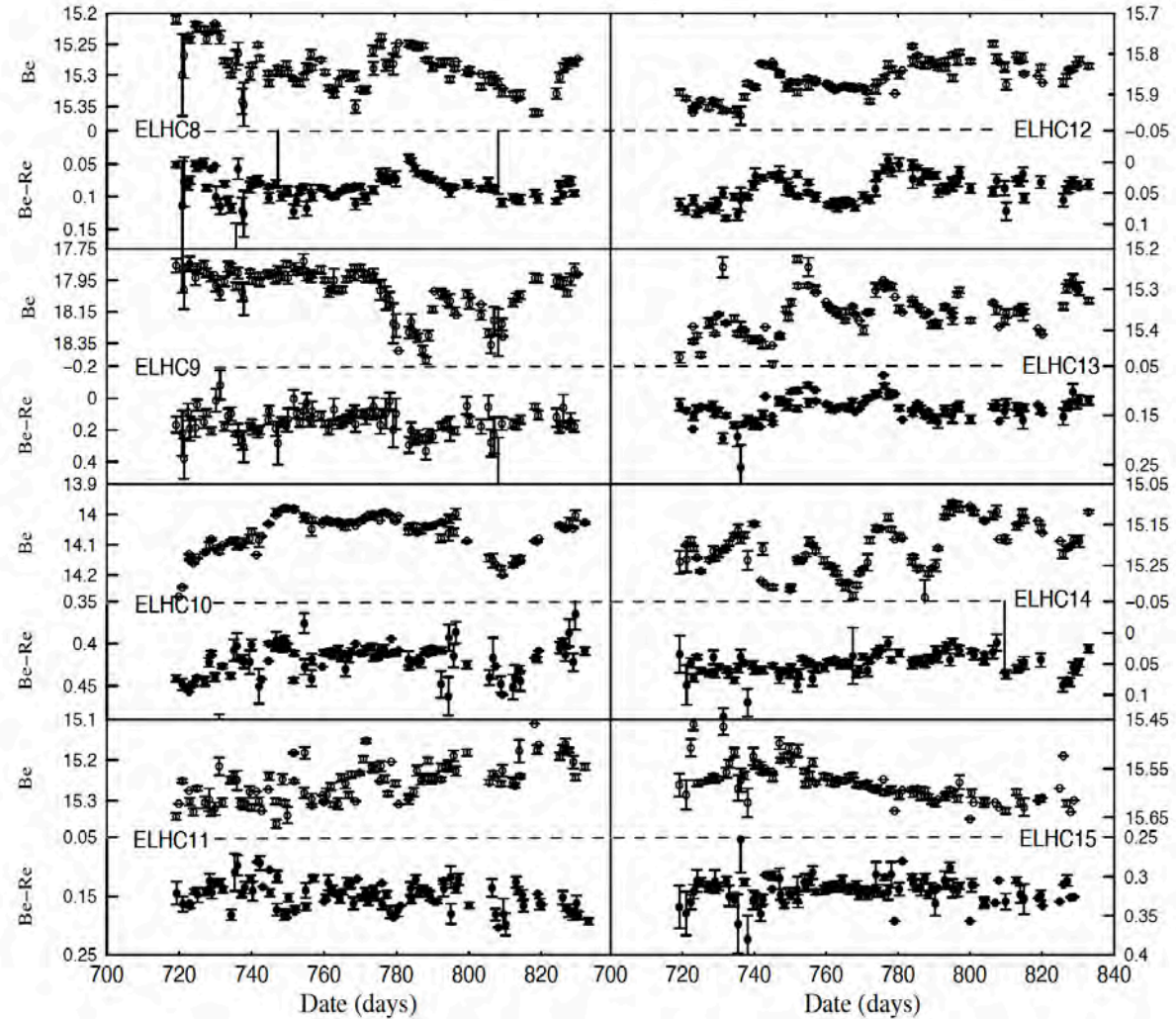
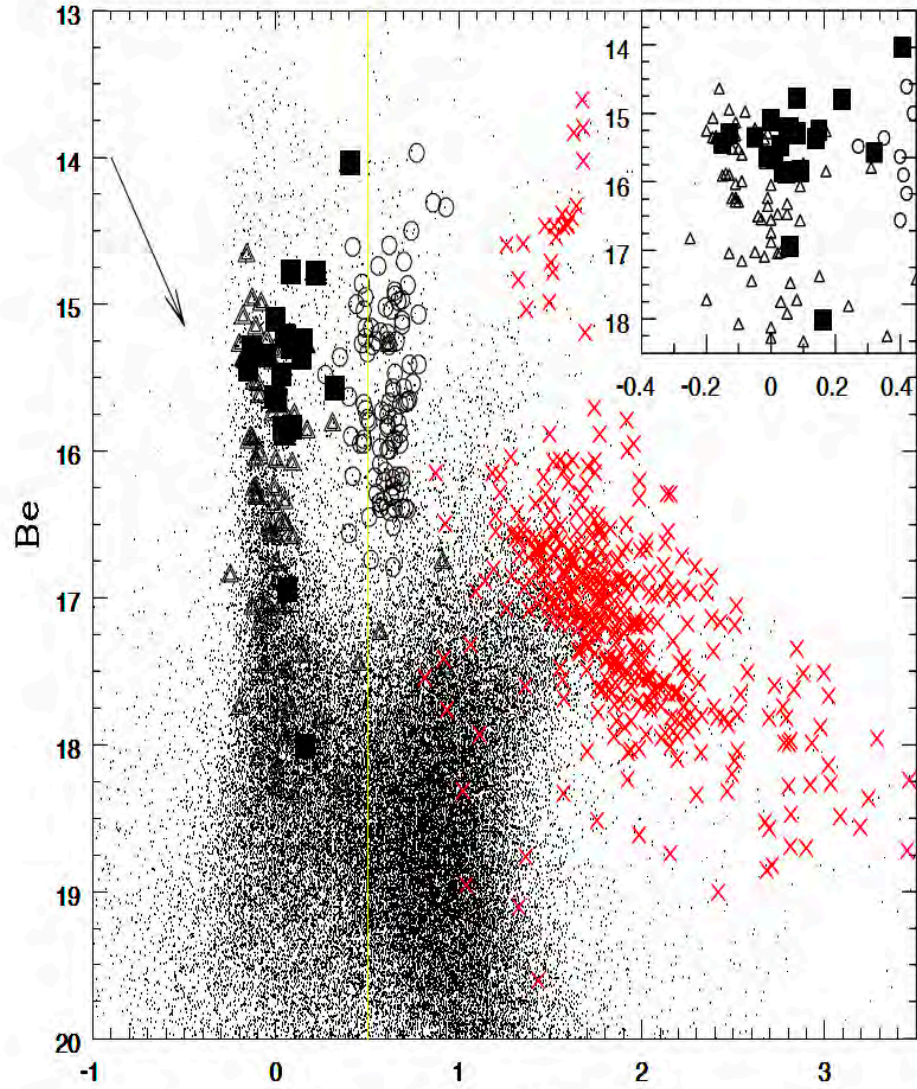


EROS-2 Eclipsing binary...

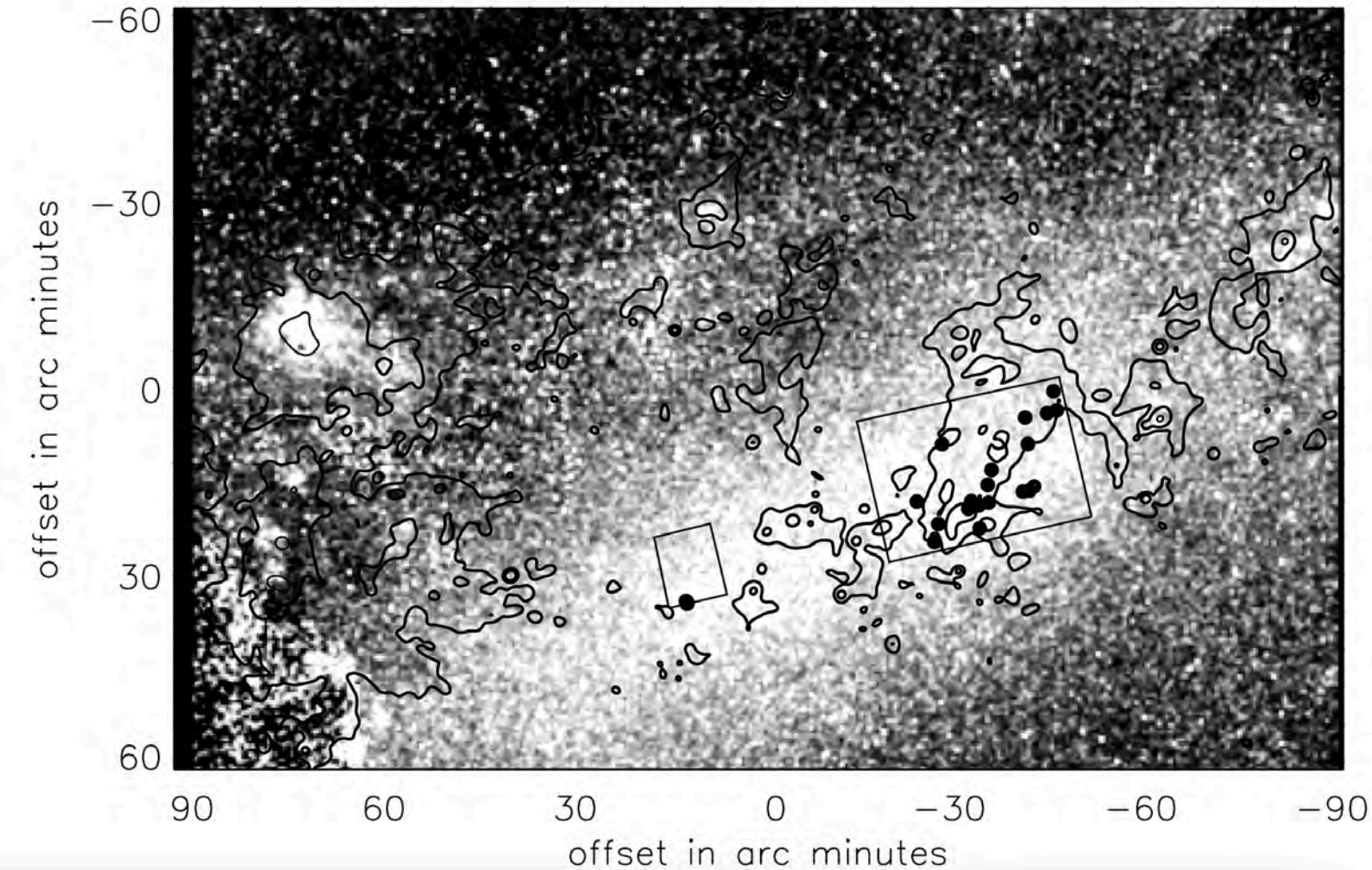


Pre main sequence stars in the LMC and SMC ?

W. J. DE WIT ET AL., 2001



Pre-MS and post-MS stars in the bar of LMC



Beaulieu+1996, Science
Beaulieu+1999, de Witt 2001, 2002, 2003

Among the first microlensing candidates

Be stars, eclipsing binary, flares, ...
Some real ones, some variable stars.



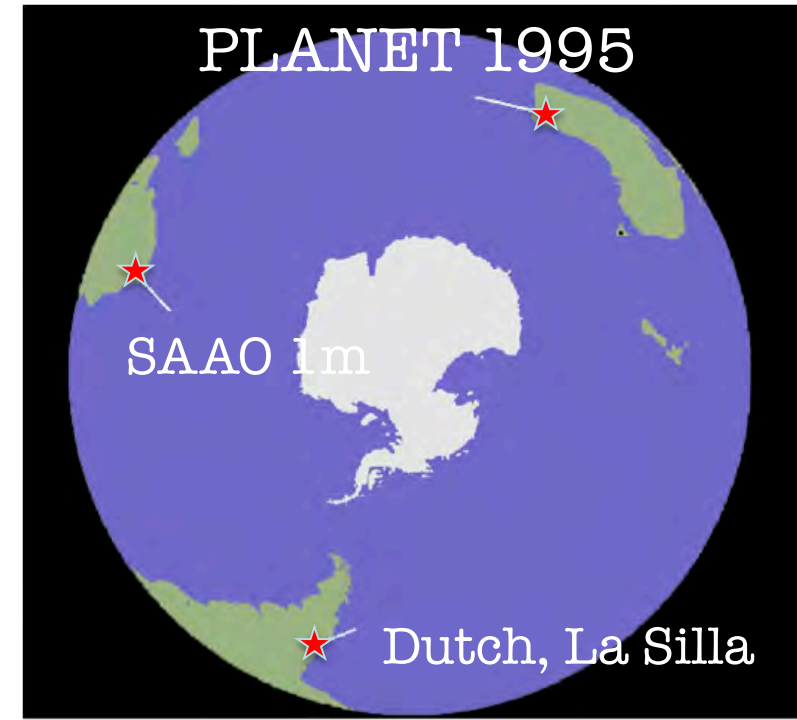
Headings towards microlensing follow up

Gould et Loeb 1992 : « Planets in a solar-like system positioned half-way to the Galactic center should leave a noticeable signature (magnification larger than 5 percent) on the light curve of a gravitationally lensed bulge star in about 20 percent of the microlensing events. »

Livermore 1995 paper signed about making public alerts

Let's build a network of telescopes to do follow up !

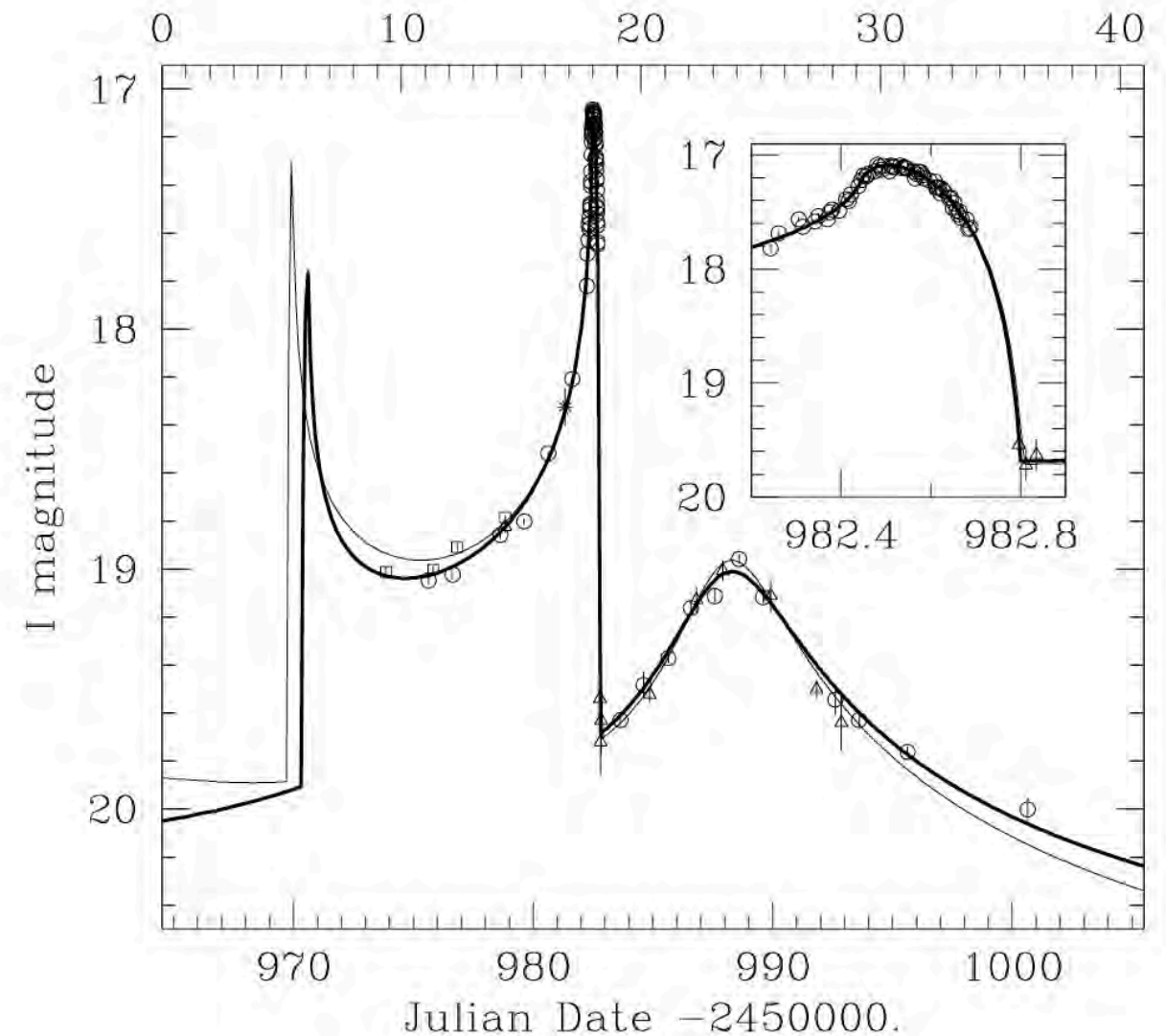
GMAN, PLANET, MPS



1998, catching the caustic exit of an SMC binary lens

Consistent with ordinary self-lensing in SMC

Observed by MACHO, EROS, OGLE, PLANET, MPS



In the previous millenium, EROS & MACHO days

- Cool to spend weeks on the mountain, especially when you have a community of astronomers around (1990s, golden years)
- Low computing power, low storage, limited numerical libraries (NERD !)
- Good years with particle physicists and a few astronomers
(Sasselov, Buchler, Lamers)
- Mutual respect between teams.

I came in microlensing for « variable stars » 31 years ago.

I evolved into a fully dedicated member of the Microlensing cult.

Join the microlensing cult !

From exoplanets, to stellar atmospheres, white dwarfs, black holes, primordial black holes...

The golden era is starting.