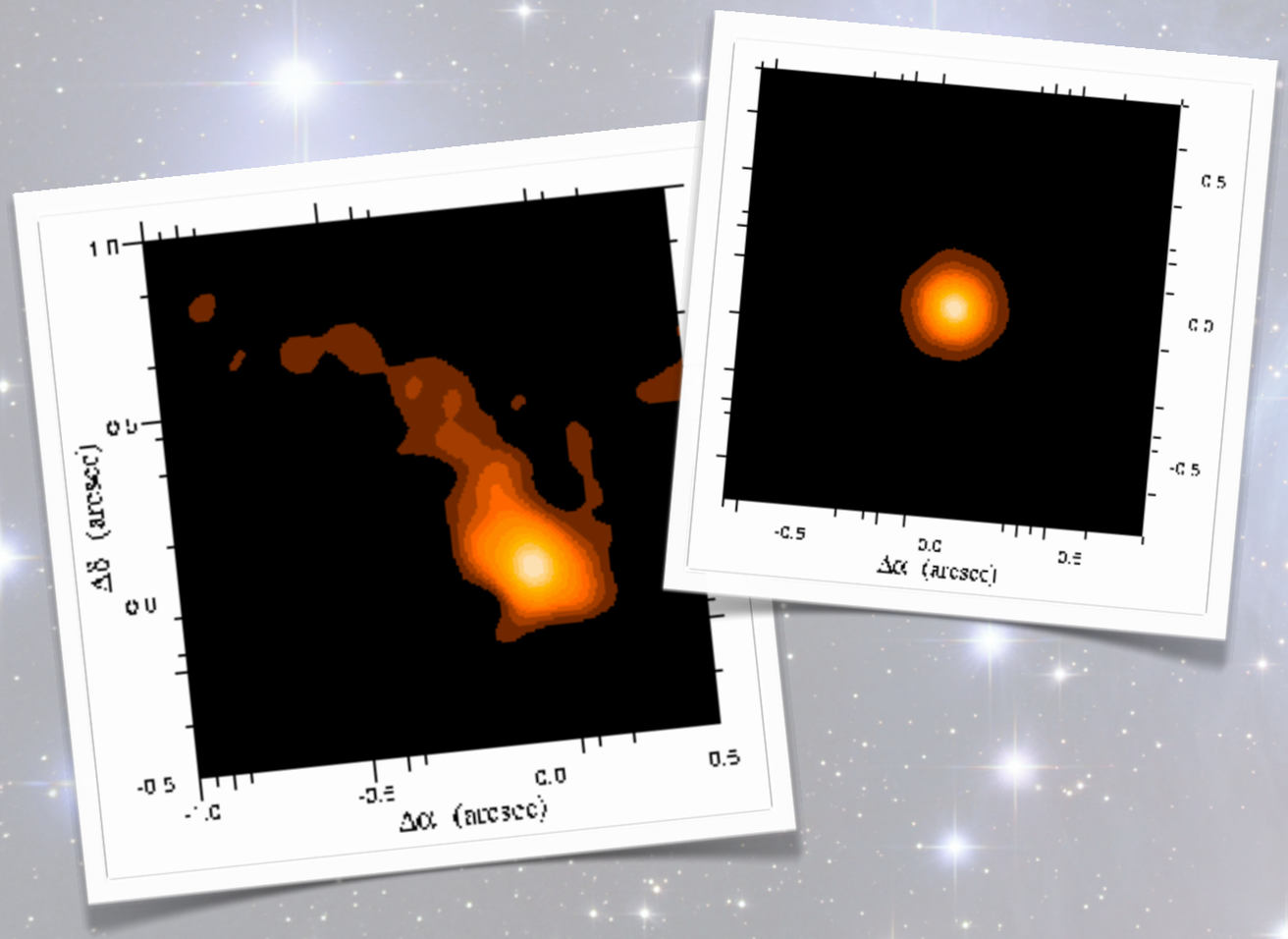
Study of the extended envelope of R Aqr through imaging with long-baseline interferometry

Proposal for the period 93A



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Target

R Aquarii :

Binary system (1 Mira variable star & 1 white dwarf)
Huge mass loss (extended envelope)
Evolutionary state hard to define
Angular diameter : 13 mas (Van Belle et al. 1996)

Magnitudes :

V-Band : 7.69
H-Band : -1.103

Coordinates :

RA : 23 43 49.46201
DEC : -15 17 04.1385

Scientific Background

- Observations with IOTA (Ragland et al. 2008)
  - → Imaging of the envelope at 3 different wavelengths
    Water molecular shape highly clumpy
    Bipolar feature parallel to a large scale jet

- Observations with VLBA (Ragland et al. 2008)
  - → Obs. of the SiO maser emission in the outer molecular envelope

- Observations MIDI (Zhao-Geisler et al. 2012)
  - → Obs. of the Silicate dust shell

Scientific Background

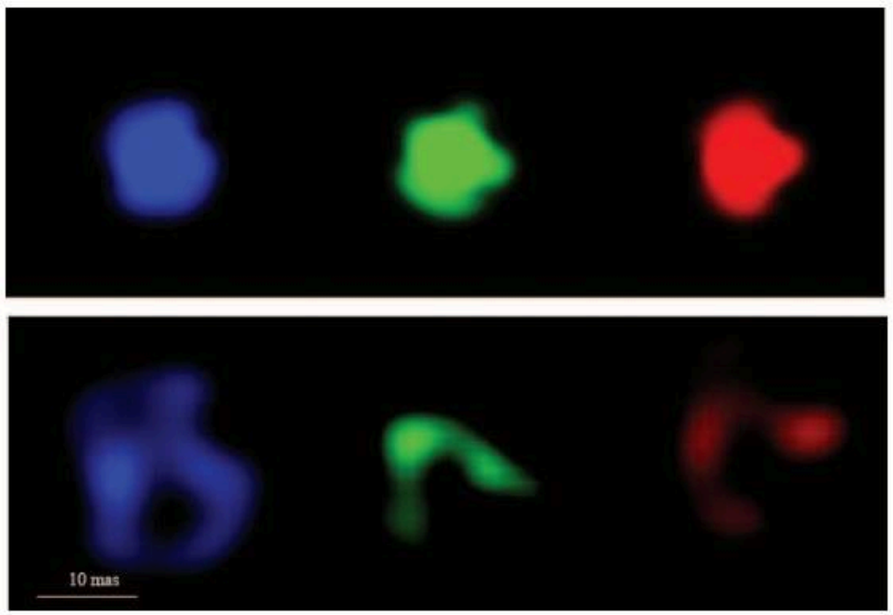


FIG. 9.—Reconstructed near-infrared images of R Aqr. The blue, green, and red color images (*from left to right*) represent 1.51, 1.64, and 1.78 μm respectively. The top row shows reconstructed images, and the bottom row shows primarily contributions from the shell, since we subtracted a Gaussian function from the reconstructed images to remove the stellar component. North is up, east to the left.

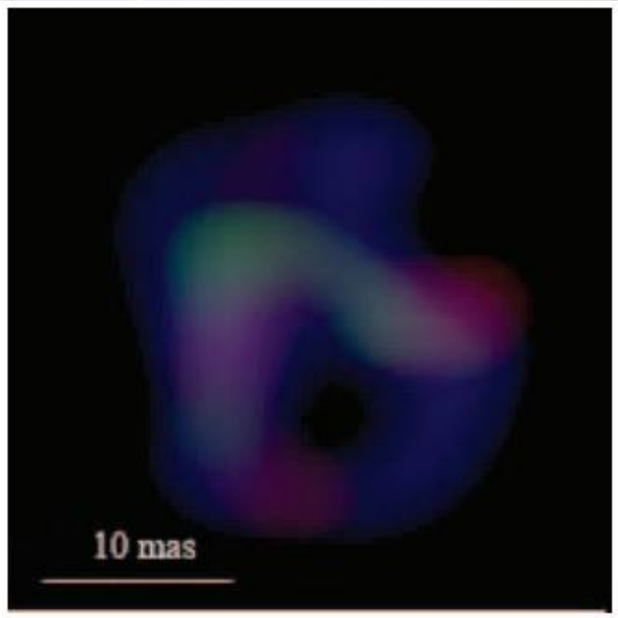
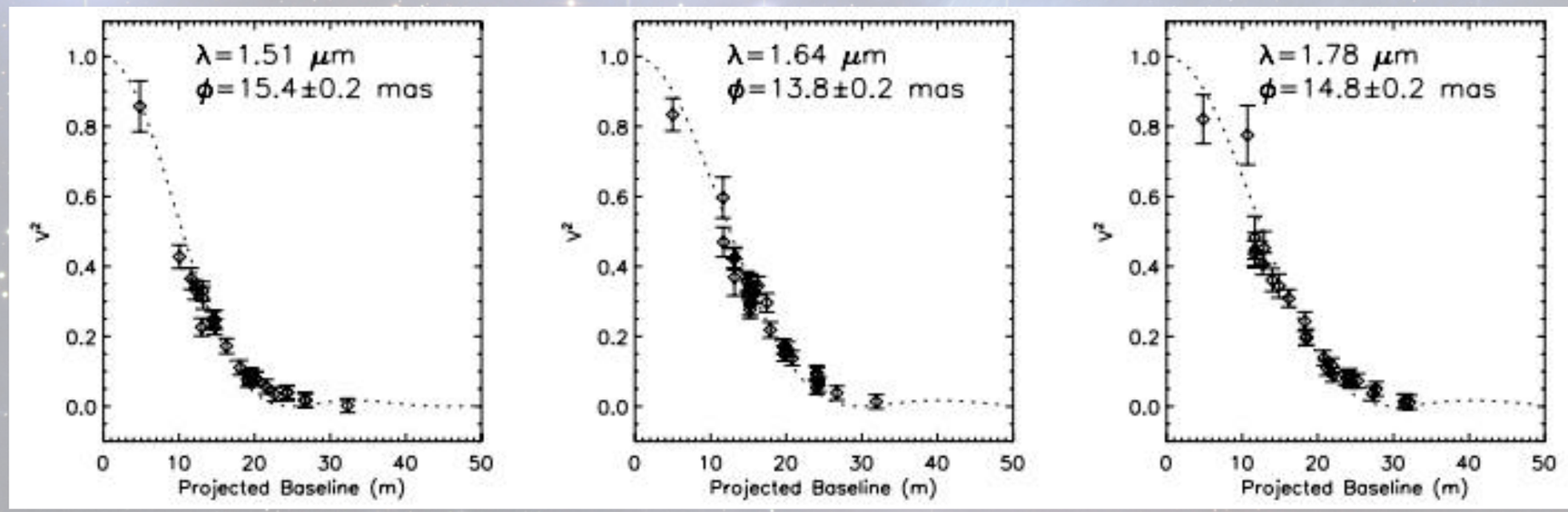


FIG. 12.—The three wavelength images; blue, green, and red represent 1.51, 1.64, and 1.78 μm respectively. North is up, east to the left.



Ragland et al. 2008 : imaging of the envelop with IOTA

Aim of the present proposal

- Complete the precedent observations to get a good coverage in spacial frequencies

- Reconstruct the image of the envelope using Mira and Bsmem

- Obtain a better precision on the angular diameter

- Estimate the mass loss and reach a better understanding of the dynamic of the matter in this system

FEASIBILITY : 100 % :-)

Technical elements

Instrument : PIONIER

A1-G1-K0-J3 (bigest quadruplet to resolve small details)
D0-H0-G1-I1 (shorter one to get data in the first lobe)

Advantage : 6 simultaneous vis. measurments and 4 T3

Observing mode :

"Delegated visitor" mode
(No real constraint on the date of observations)

Amount of requested time :

5*0.5 nights, to get a good coverage of the (u,v) plane

Technical elements

Observability during the requested period and (u,v) coverage :