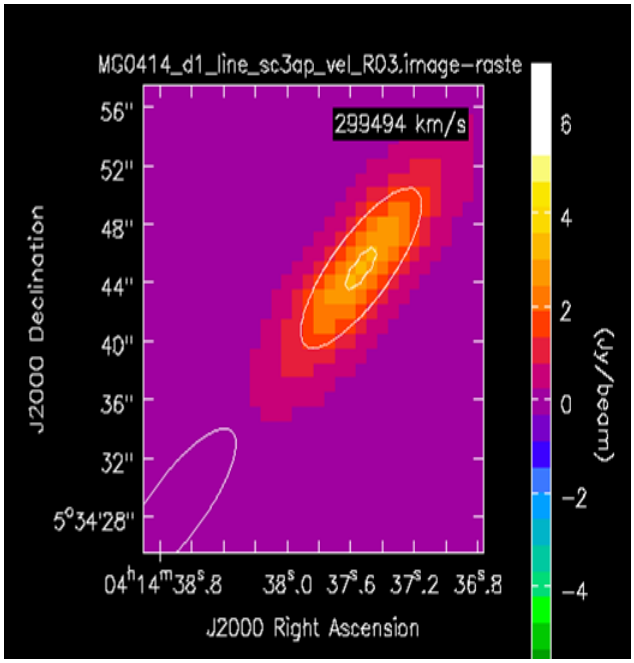
Deep Space Exploration Society Science Meeting



MG0414+0534
Gravitational Lens

April 27, 2020

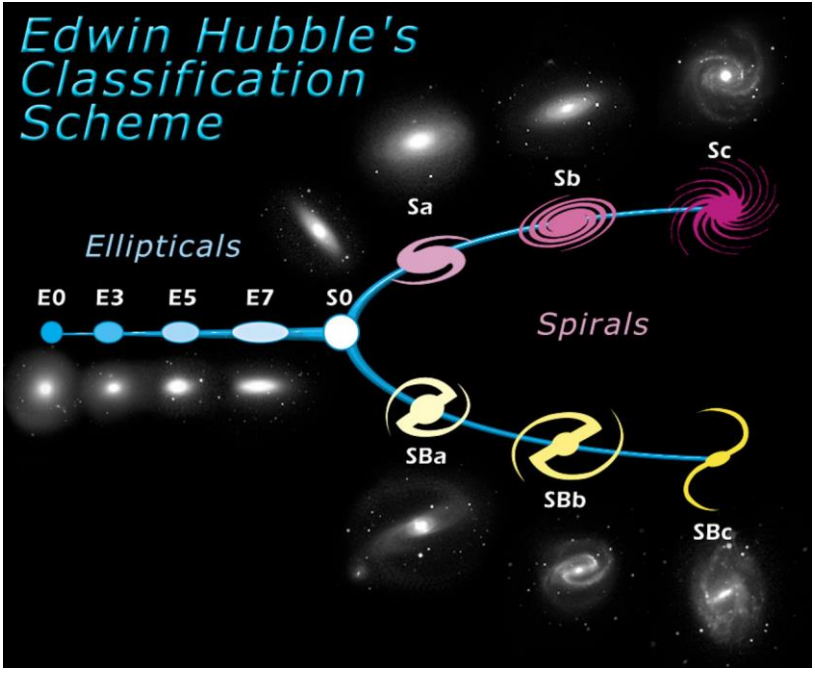
Dr. Richard Russel

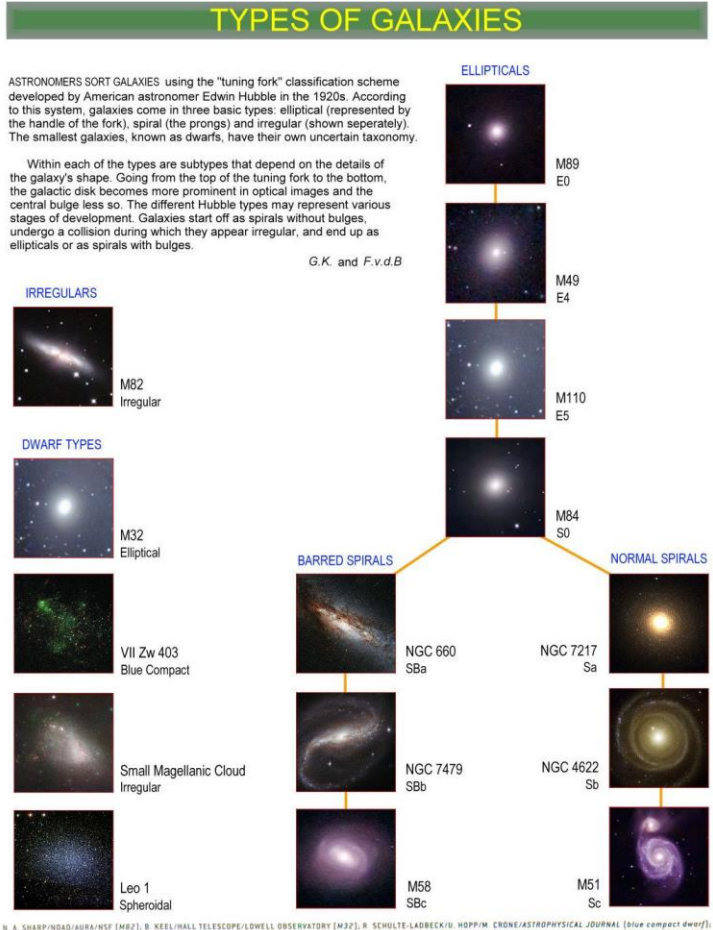
DrRichRussel@netscape.net

Information

- 9 ft Dish – taking 2-3 day measurements at 5 degree Declination intervals
- SuperSID – still taking data – low flare activity
- Radio Jupiter – still need to get a new receiver and setup at site (new member project?)
- Pulsar – coordinating a time to take equipment to site for measurements
- SARA East Conference – recommend everyone virtually attend: August 2-5
- New DSES publications tab on website – posted papers that have been published in journals

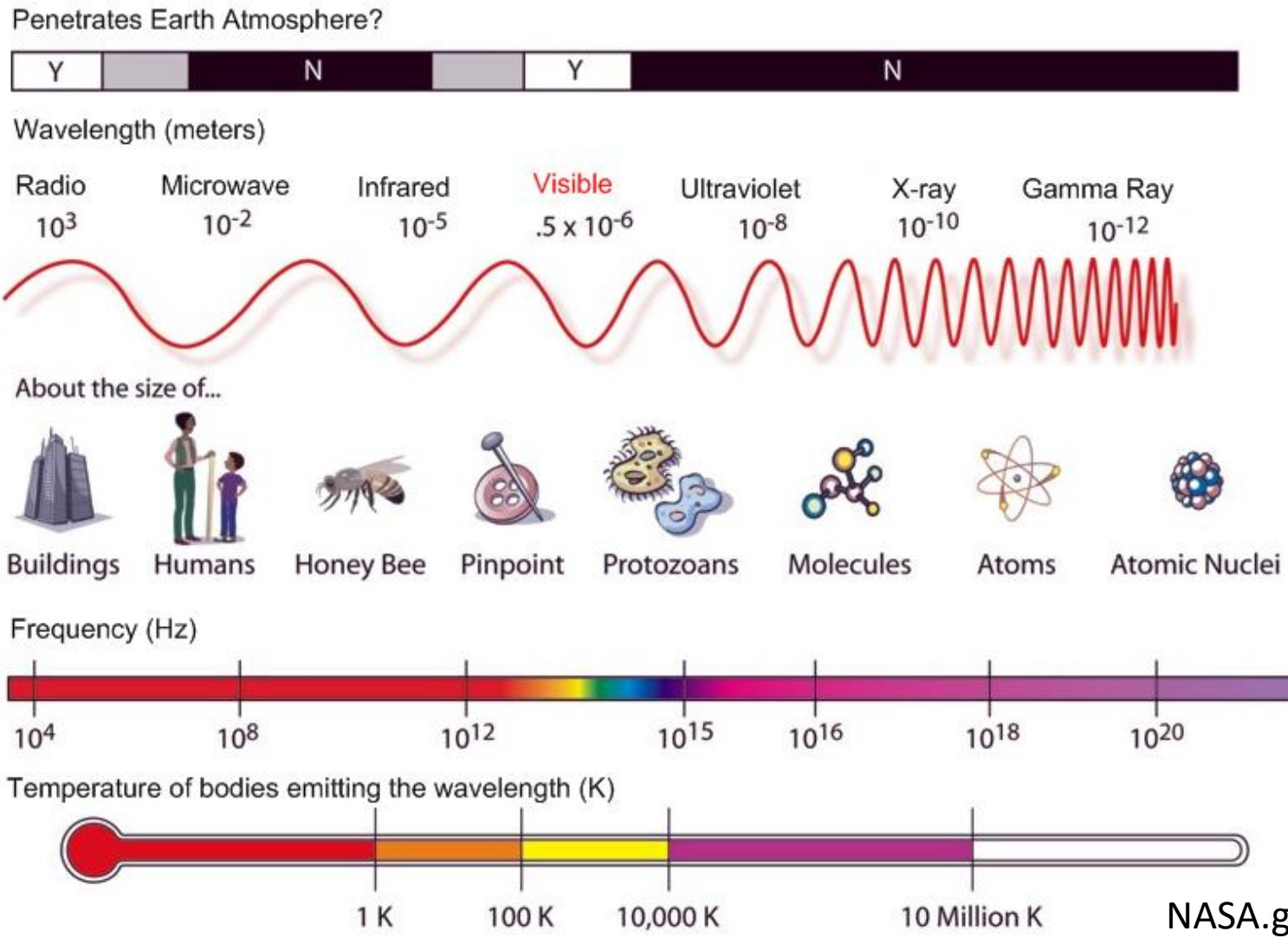
Science Training
Galaxy Classifications





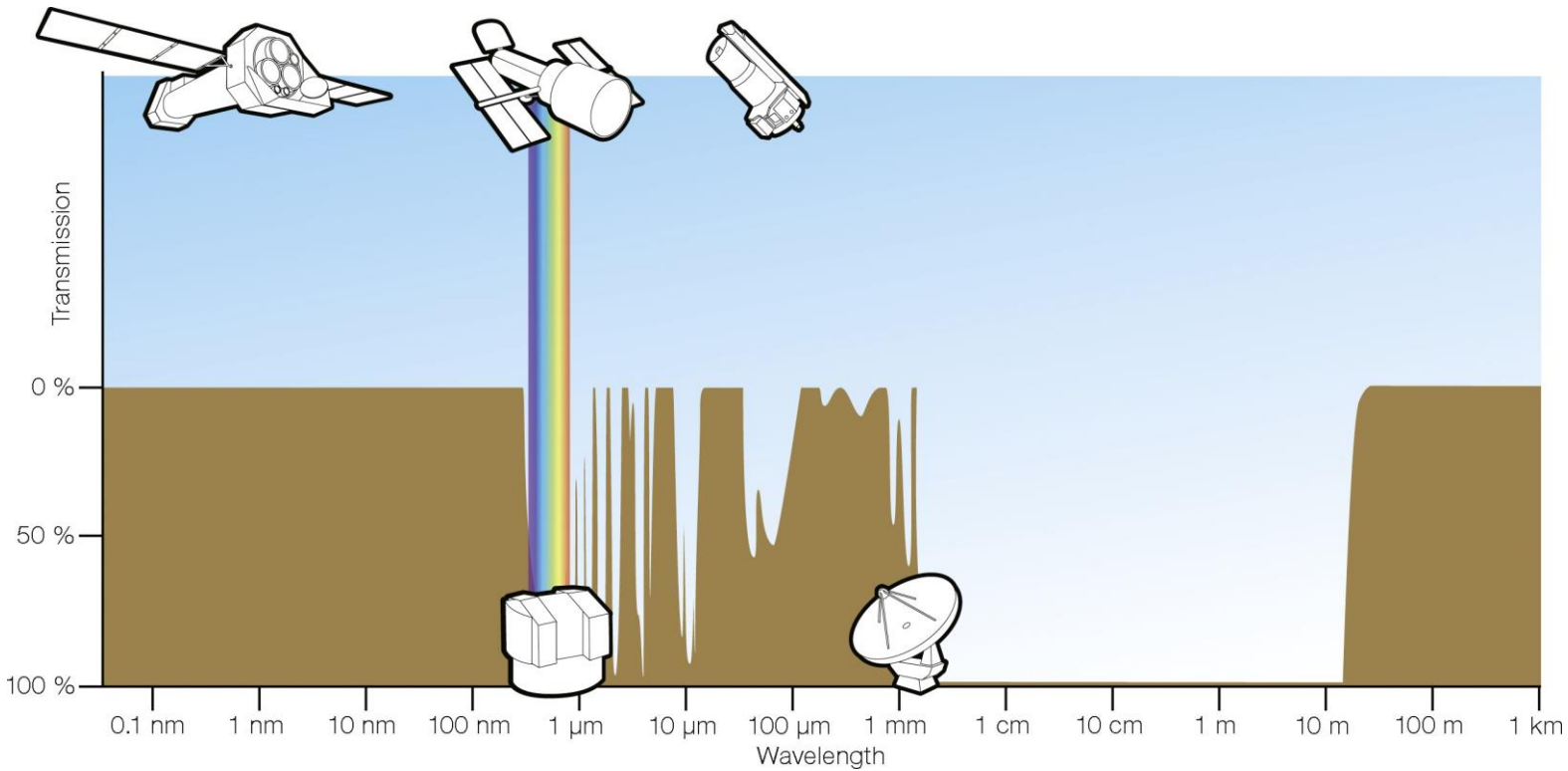
http://www.universe-review.ca/I05-01-galaxytypes.jpg

The Electromagnetic Spectrum



NASA.gov

Atmospheric Window



Source: https://www.cv.nrao.edu/~sransom/web/Ch1.html

ALMA Opacity Chart

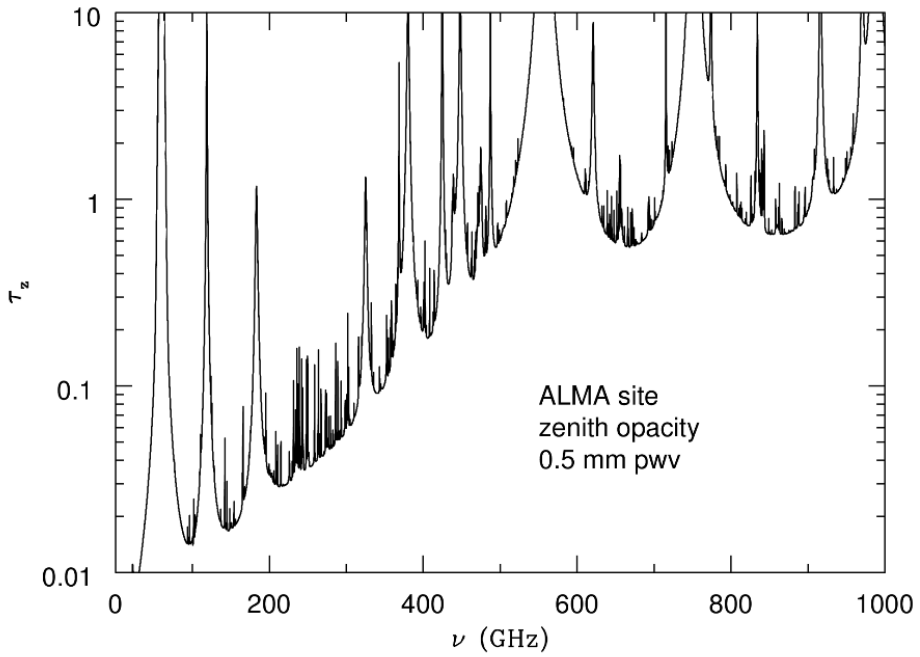
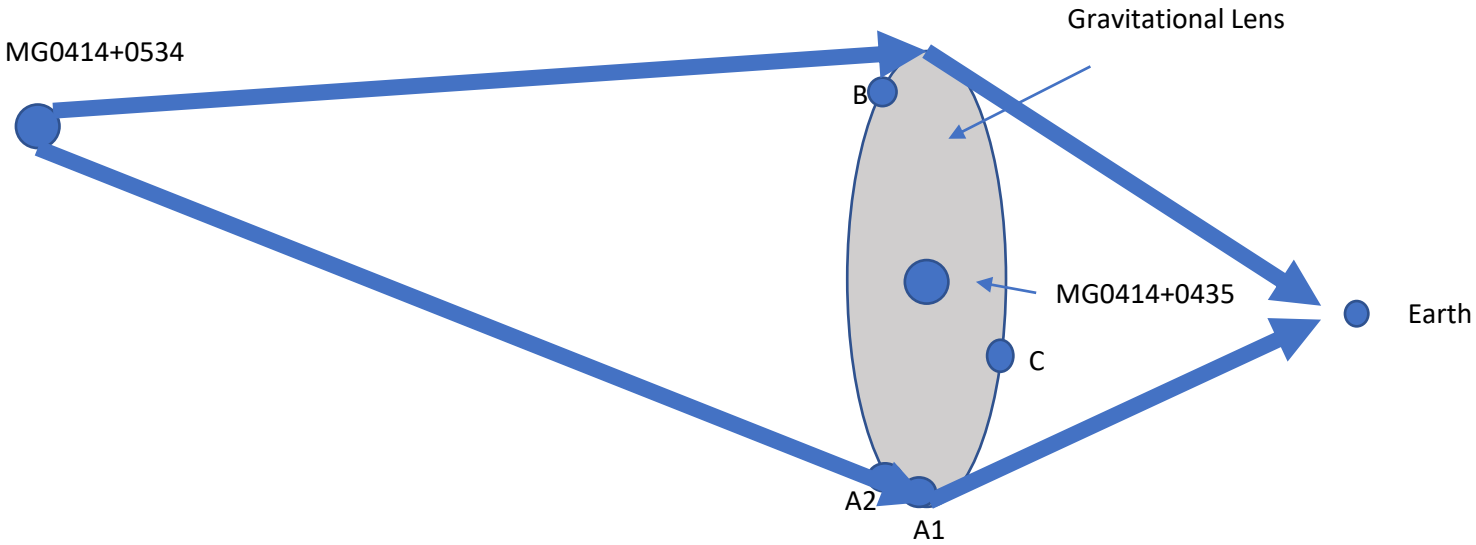


Figure 1.3: Zenith atmospheric opacity τ_z for 0.5 mm pwv at the Atacama Large Millimeter Array (ALMA) site. Water-vapor absorption is responsible for the broad opaque bands centered on 557 GHz, 752 GHz, and 970 GHz. The plotted data are from https://almascience.eso.org/about-alma/weather/atmosphere-model.

Source: https://www.cv.nrao.edu/~sransom/web/Ch1.html

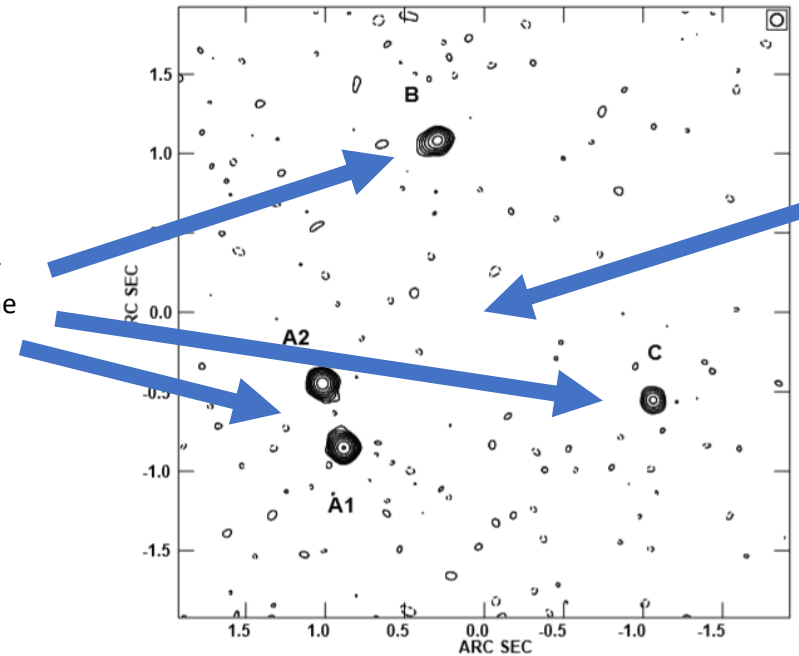
How Gravitational Lenses Work

Gravitational Lens Theory



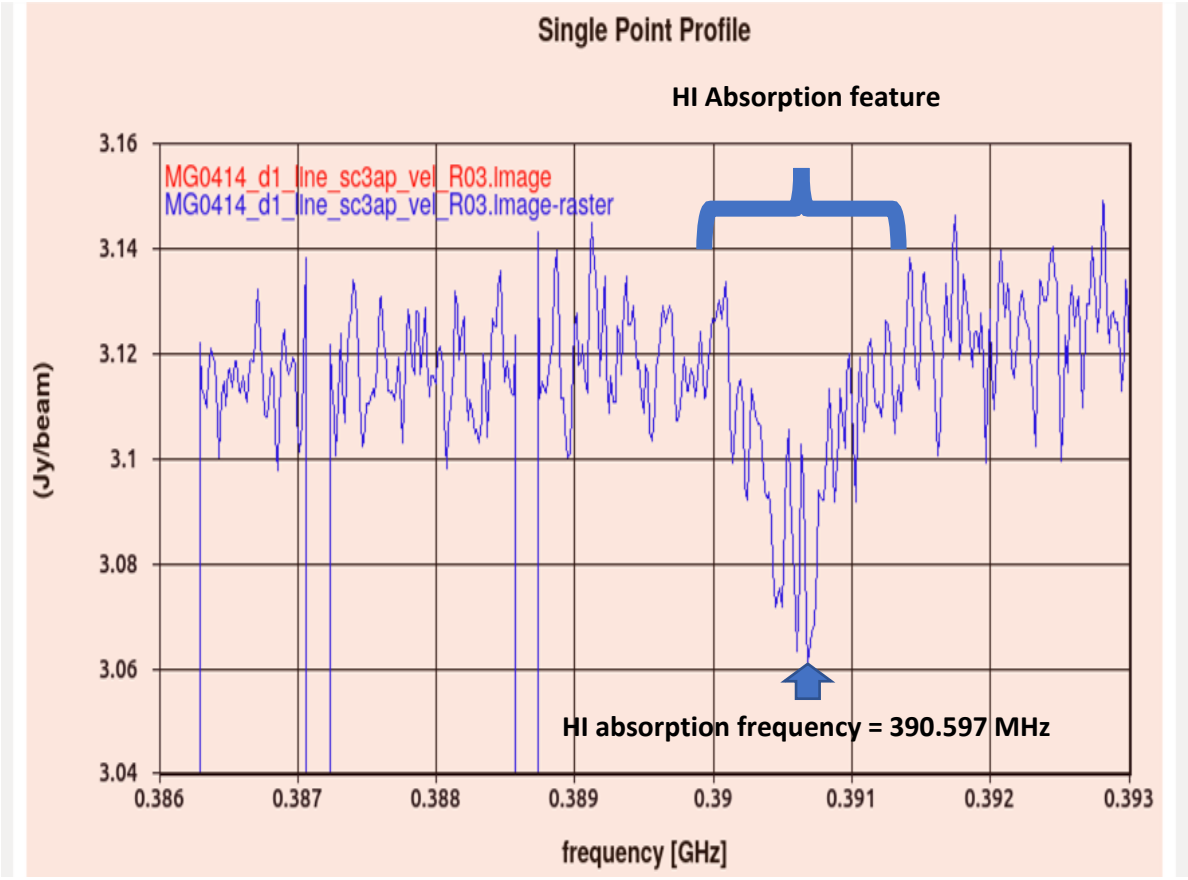
MG0414+0532 Observation

MG0414+0532 quasar ‘duplicated’ around the gravitational lens

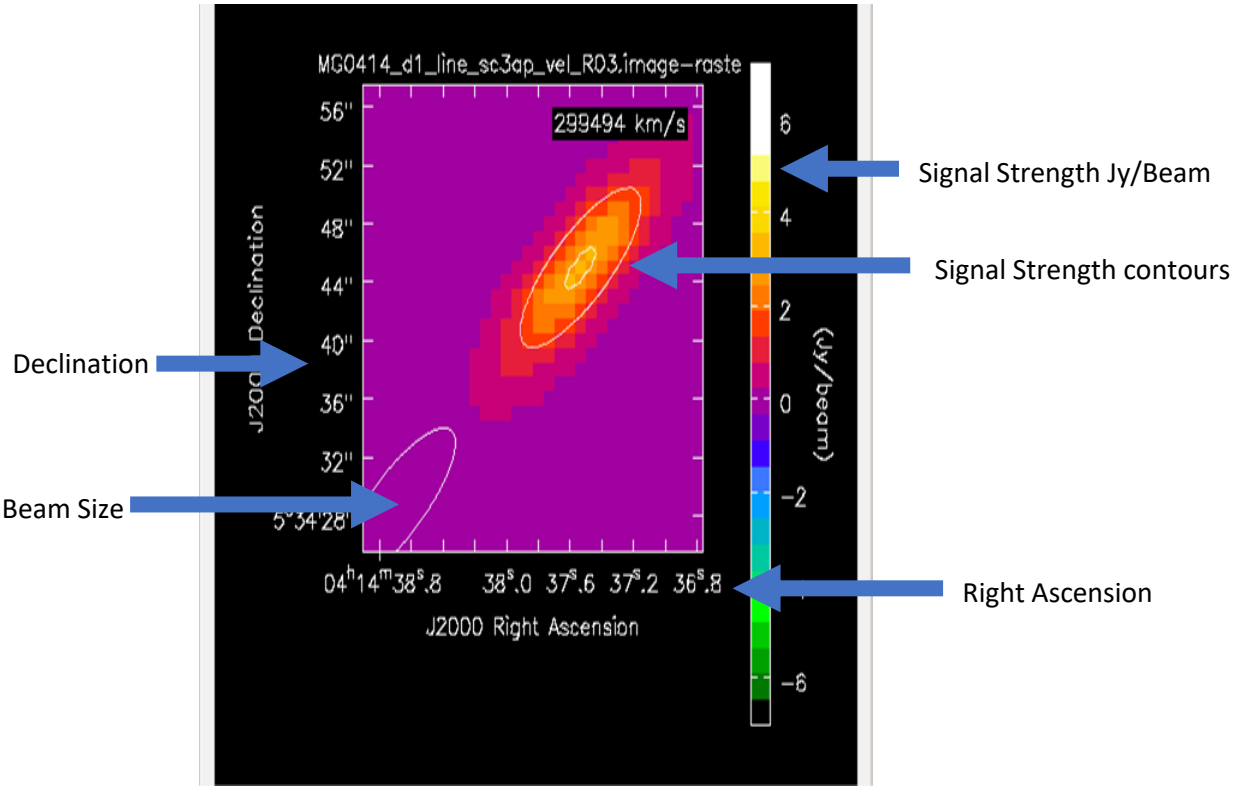


Approximate location of gravitational lens

HI Absorption Line Reveals Age of MG0414+0532

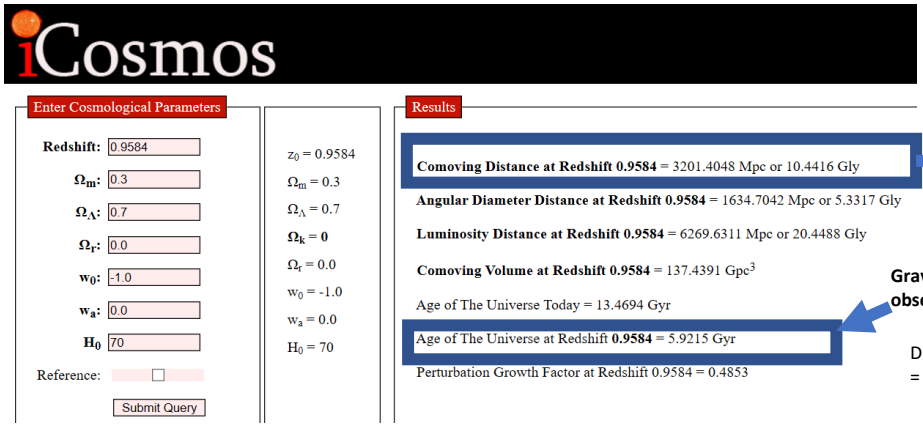


MG0414+0532
Archive Data Reduction – Dr. Russel



Using COSMOS to determine Redshift Data

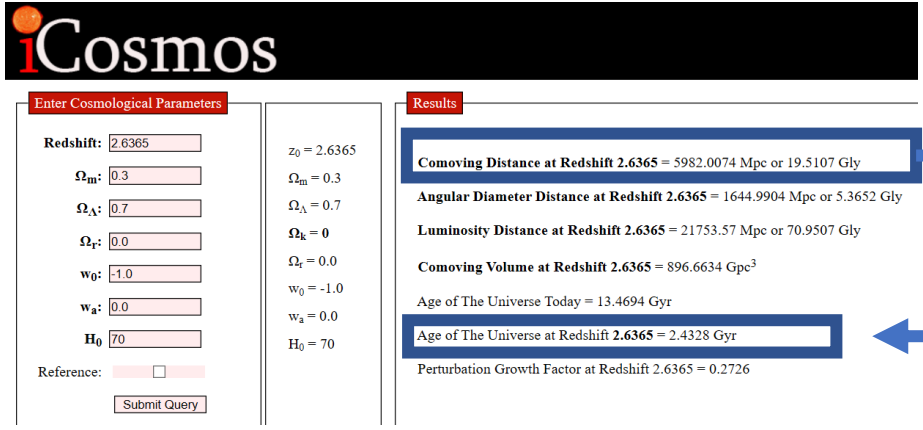
MG0414+0435
Gravitational Lens



Gravitational lens observed age

Distance between source and lens
= 5982 – 3201 = 2781 MPc

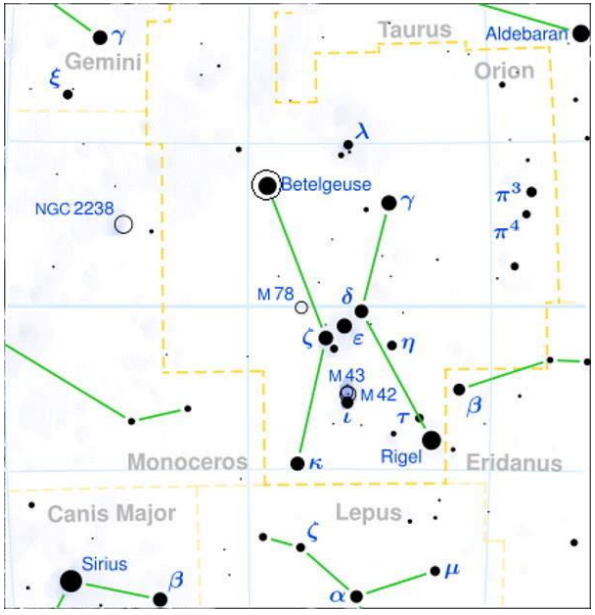
MG0414+0532
Quasar Source



Source observed age

Betelgeuse Update

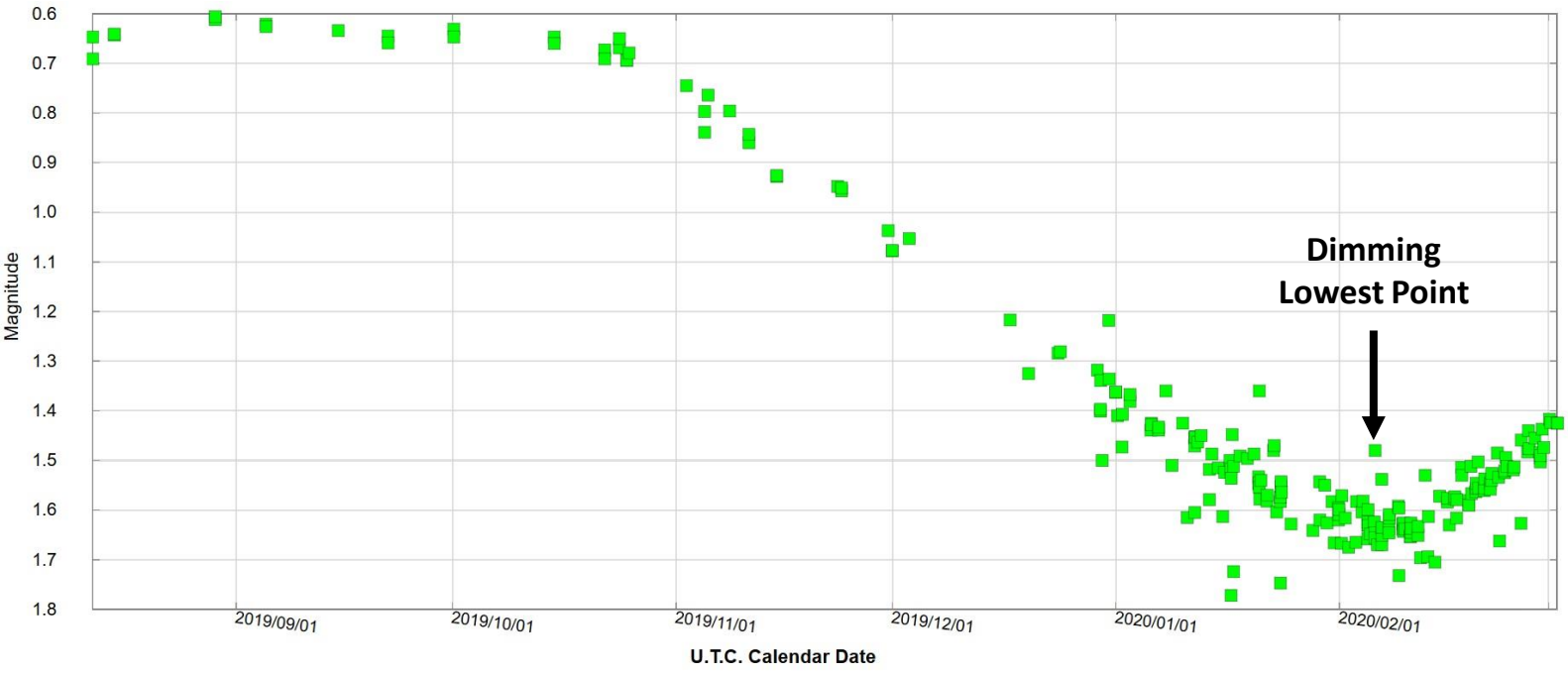
Betelgeuse (Orion Constellation)



- Red super giant
- Distance 700 light years
- RA: 05h55m10.3s
- DEC: +07° 24’ 25.4’’

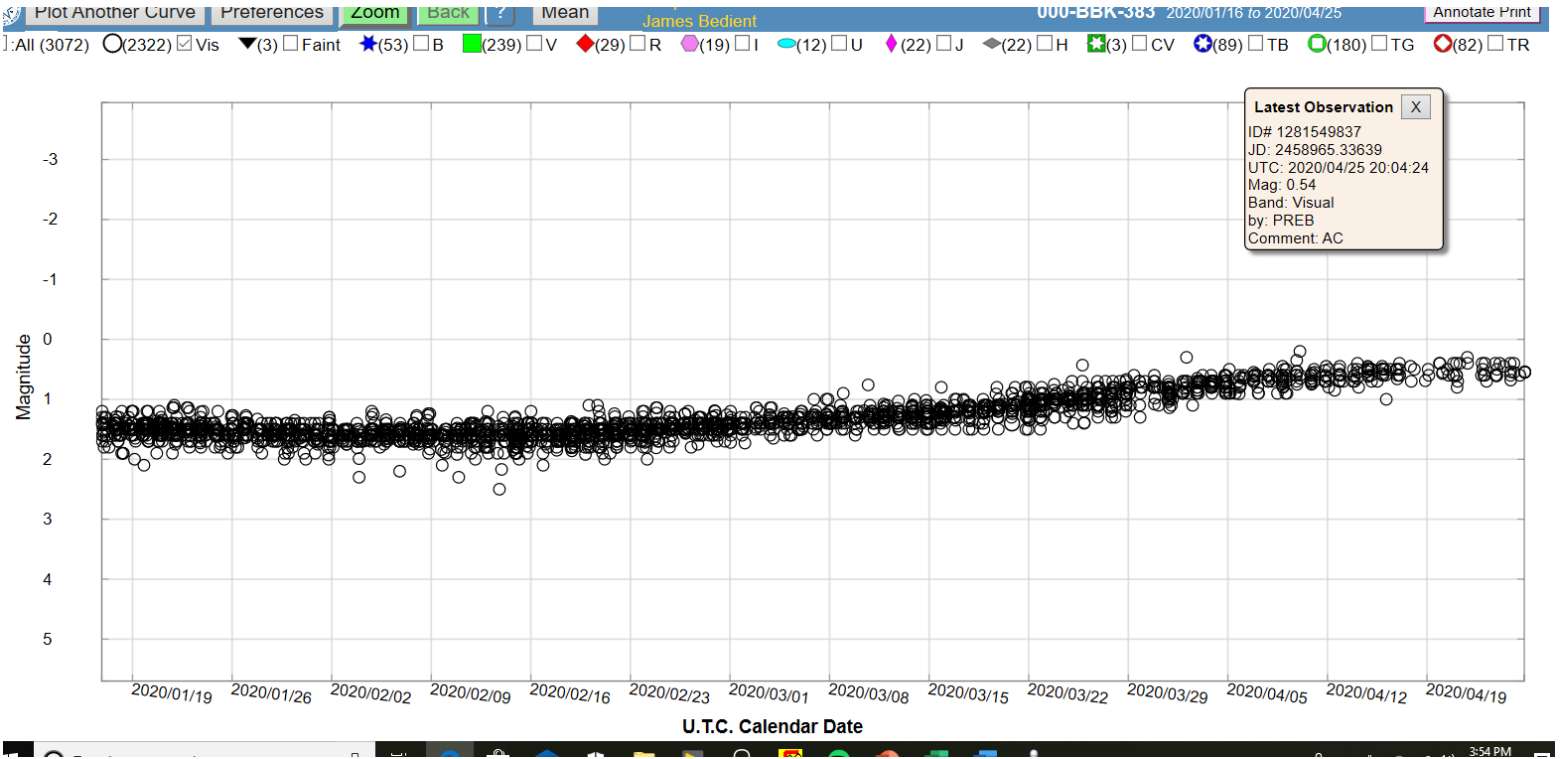
Source: Wikipedia

Betelgeuse Magnitude History



https://www.aavso.org

Latest Betelgeuse Light Curve



Source: AAVSO.org

Black Hole or Neutron Star?

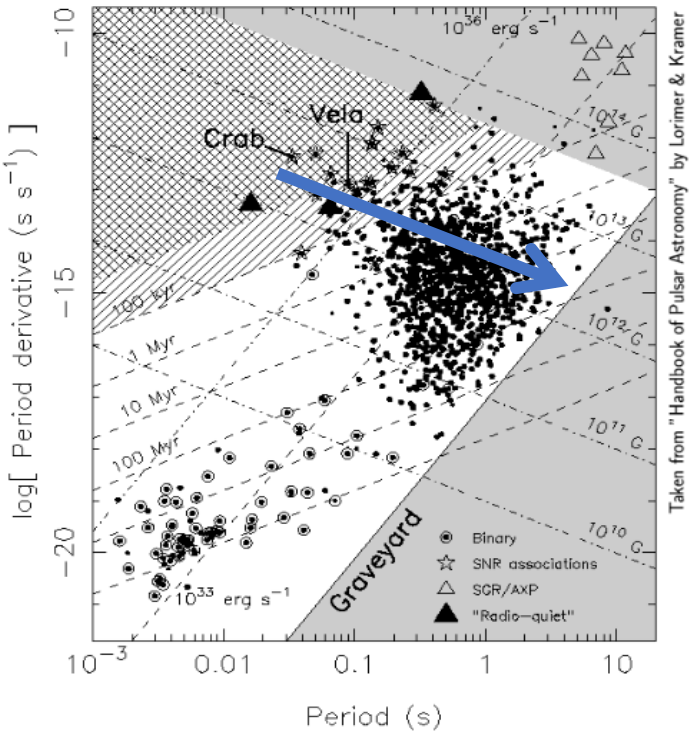
Parameter	Black Hole Requirement	Neutron Star Requirement	Betelgeuse
Mass	2.17Msun	1.4 Msun	1.5 Msun from a 5-30 Msun star

Opinion is that Betelgeuse will turn into neutron star / pulsar

It depends on how much mass is lost during supernova

Source: https://en.wikipedia.org/wiki/Black_hole

Betelgeuse Pulsar Life Prediction



Note: Since there is no binary star – the neutron star will wind down and will not end up as a millisecond pulsar

Source: www.Wikipedia.org

Supernova Early Warning System

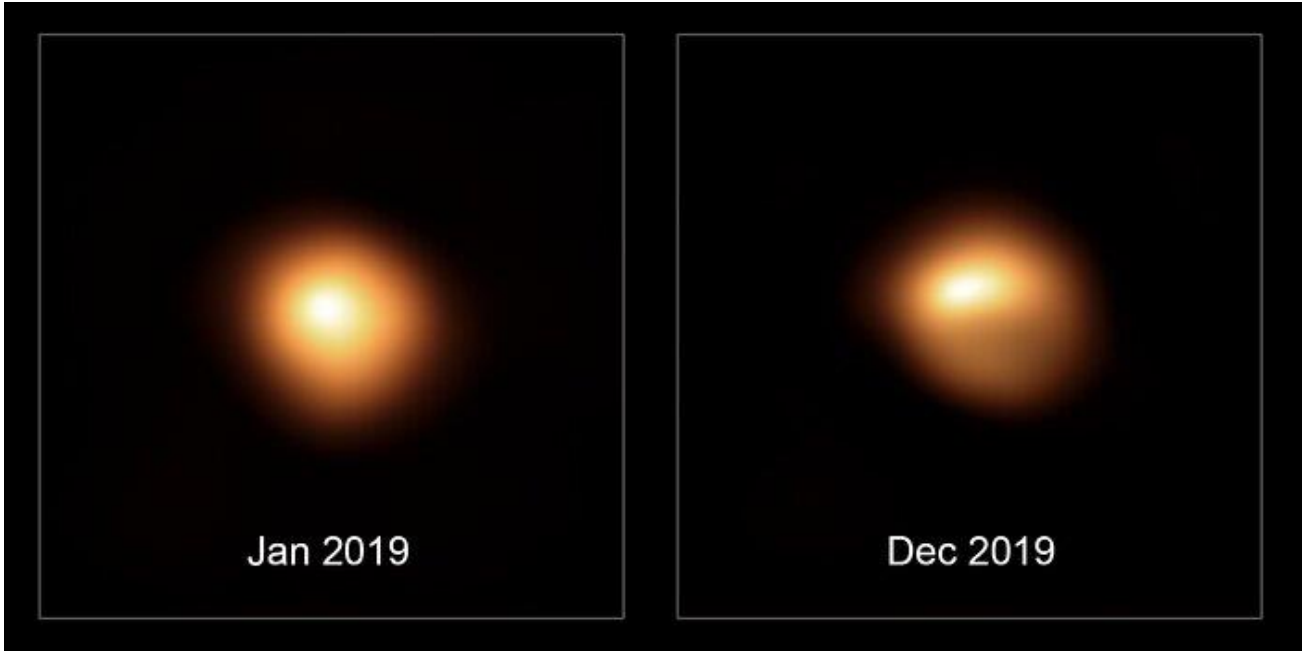
(Supernova Early Warning System) network [https://snews.bnl.gov/], which would send an alert if indicator neutrinos were detected.

The gravitational collapse supernova releases most of its binding energy in the form of 10-30 MeV neutrinos.

A photon may take hours to days to pass through the solar envelope, but a neutrino will pass through immediately. This will provide an early warning to optical observers.

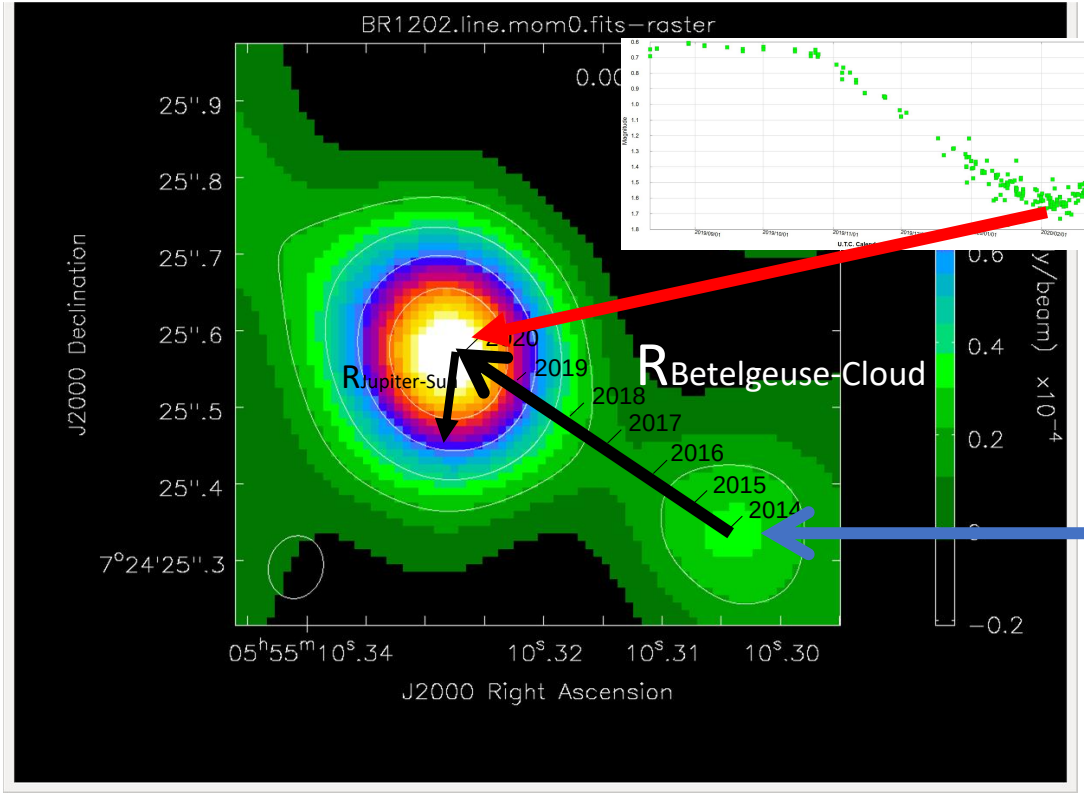
http://hep.bu.edu/~superk/gc.html

Betelgeuse Images

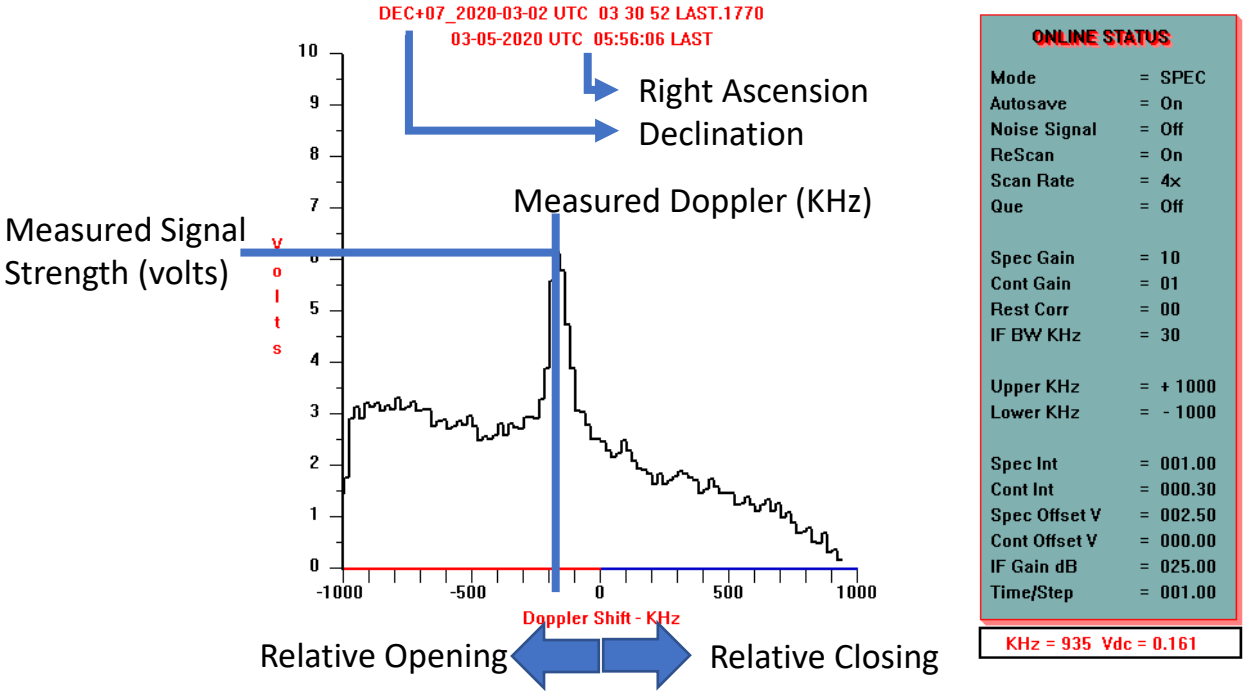


Source: https://media.breitbart.com

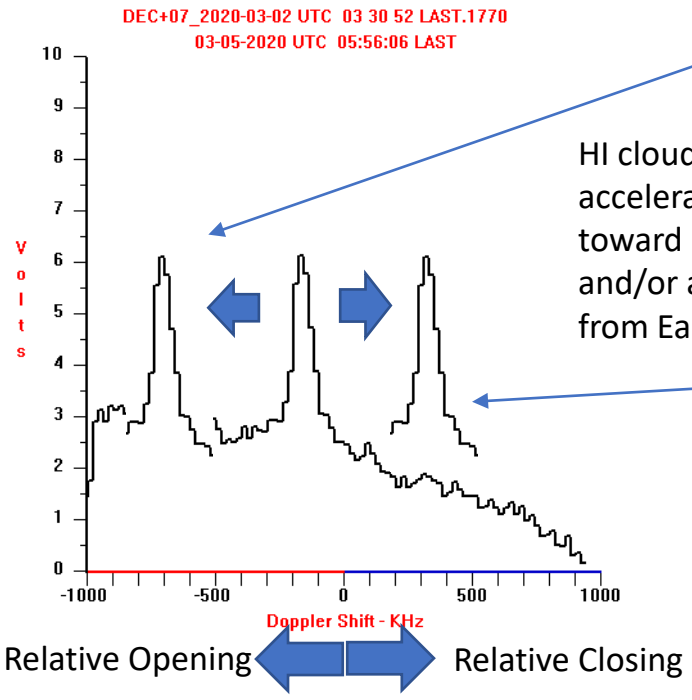
What if the image artifact was a real cloud?
Would it be able to move at the right velocity to dim the brightness per the plot?



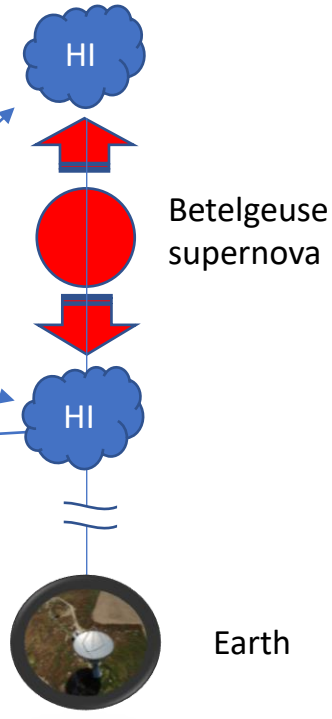
Betelgeuse HI Measurement
March 5, 2020



Betelgeuse Possible HI Measurement After Supernova



Measured Signal Strength (volts)



Questions?