Lecture 15

Blazars and other stuff

April 22 2003
8:00 PM
BPS 1420

Outline

- Stuff
- Blazars
- Observing
- Course Evaluations
- Other Stuff

Quiz time!!!!

Final quiz:

No books.
No notes.
No cheating.

Aurora

Aurora (also called Northern Lights)

Caused by the collision of solar particles with gas in the Earth's upper atmosphere.

Particles are thrown off of the Sun during large solar flares or eruptions. These charged particles are caught in the Earth's magnetic field and they fall into our atmosphere.

Images on this an following pages taken from Jan Curtis' web site : http://climate.gi.alaska.edu/Curtis/curtis.html

Although easier to see at higher latitudes, we do see them in East Lansing. Here are some photos that Dr. Smith has taken:

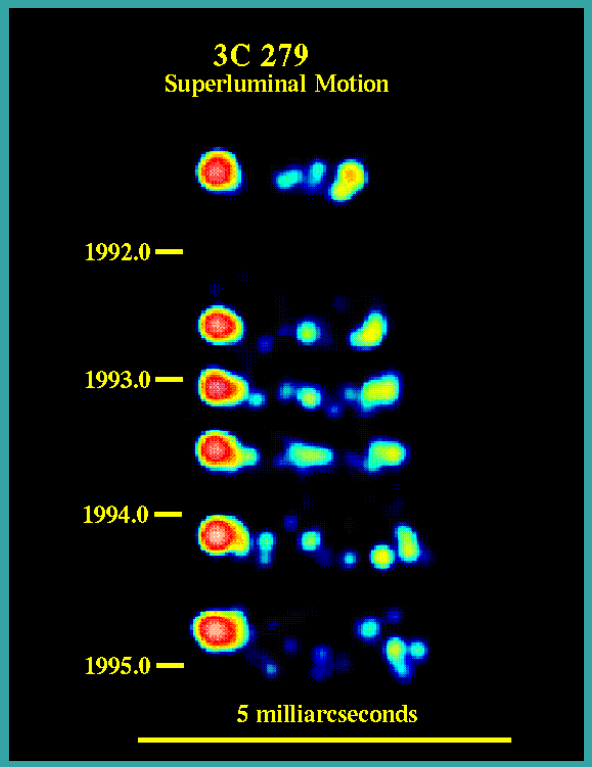
Aurora Web Pages

- http://www.spacew.com
- http://www.dcs.lancs.ac.uk/iono/aurorawatch/
- http://uvisun.msfc.nasa.gov/UVI/current_image.html
- http://www.northern-lights.no/

Blazars

- Part of the unified AGN model:
  - Look like point sources (some have nebulae)
  - Smooth and flat spectra (no strong absorption like stars would have)
  - Visible light is usually at least partially polarized
  - Output at all wavelengths varies more rapidly than a "classical" quasar (5-10% of quasars are blazars)
  - Significant portion of emission is above 100 MeV (Should explain this....)

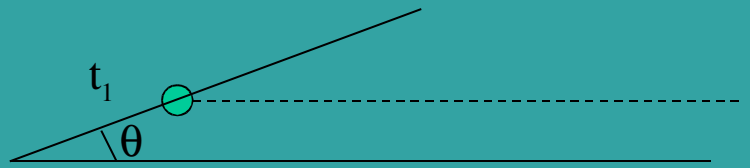
Superluminal Motion

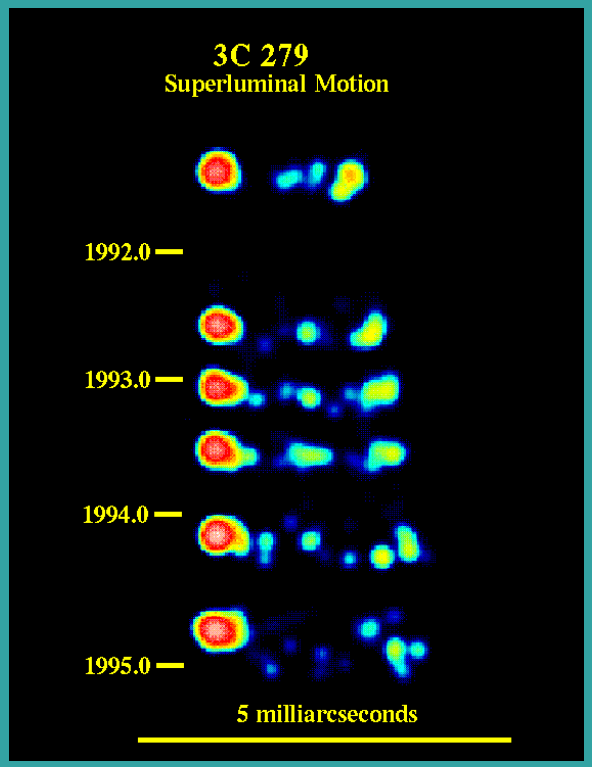


Lobe jets can appear to have "superluminal" motion. This means that if you assume that the jets are moving in the plane of the sky, the lobes seem to move faster than the speed of light (distance to object from redshift data, size of lobe measured on the sky) sometimes by as much as 10 c.

Relativity tells us that this is bad. So what is going on?

Superluminal Motion

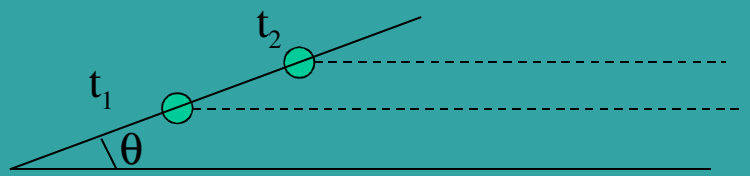


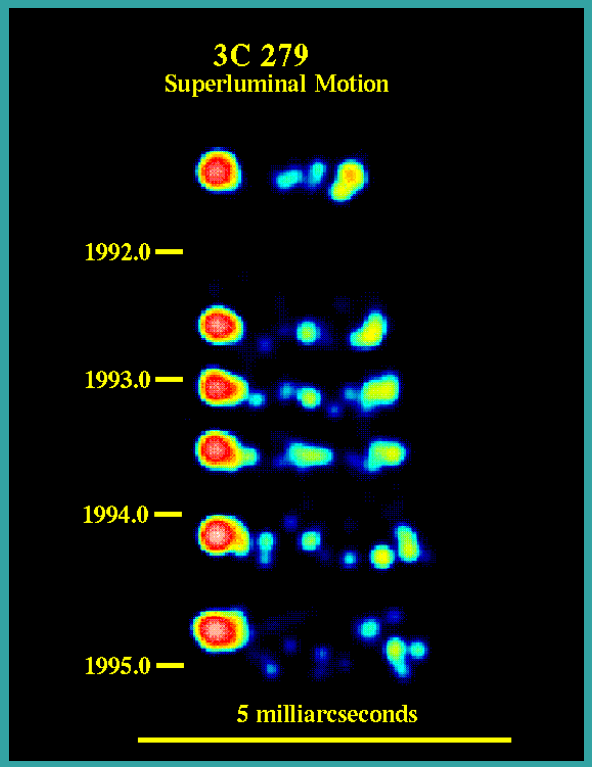


If the jets are not actually in the plane of the sky but instead are pointed towards us, we have to account for the difference in the position of the lobes at the time of the emission!

A photon is emitted at point t_1. The cloud is still moving at a significant fraction of the speed of light;

Superluminal Motion





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A photon is emitted at point t_1. The cloud is still moving at a significant fraction of the speed of light; and at some time t_2 another photon is emitted. Because the photon from t_1 has farther to travel, it will appear that the photon from t_2 has arrived too soon.

Course Evaluations

- Two sheets:
  - Green sheet
  - Bubble sheet
- Need someone to take them to Dr. Capriotti **tomorrow** (3rd floor)

  Instructor's Name: Aaron LaCluyze
  Course: AST 312 Semester/Year: Spring 2003