

Nocturnal Oxygen Spatial Heterodyne Interferometry Techniques

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Chemistry of the 3727 Doublet at Night

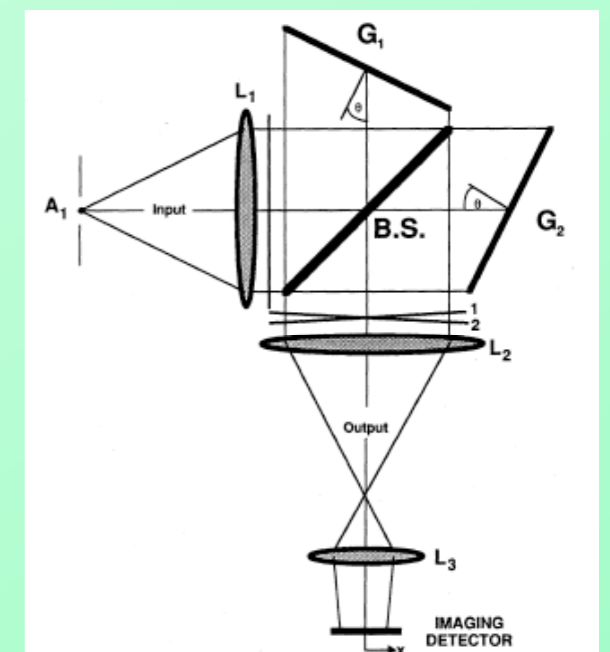
- $\text{O}^+(\text{}^2\text{D}) \rightarrow \text{O}^+(\text{}^4\text{S}) + 3727 \text{ Doublet}$
- $\text{O}^+(\text{}^2\text{D})$ state excited by nighttime photo electron impact
- Metastable state (Avg lifetime ~ 3 hrs)
- $\text{O}^+(\text{}^2\text{D}) + \text{N}_2 \rightarrow \text{O} + \text{N}_2^+$
- Intensity strength ~ 1 Rayleigh

Previous Observations

- Wallace (1959)
- Sivjee (1991)
- Mierkiewicz (2006)
- Sharpee (2008)

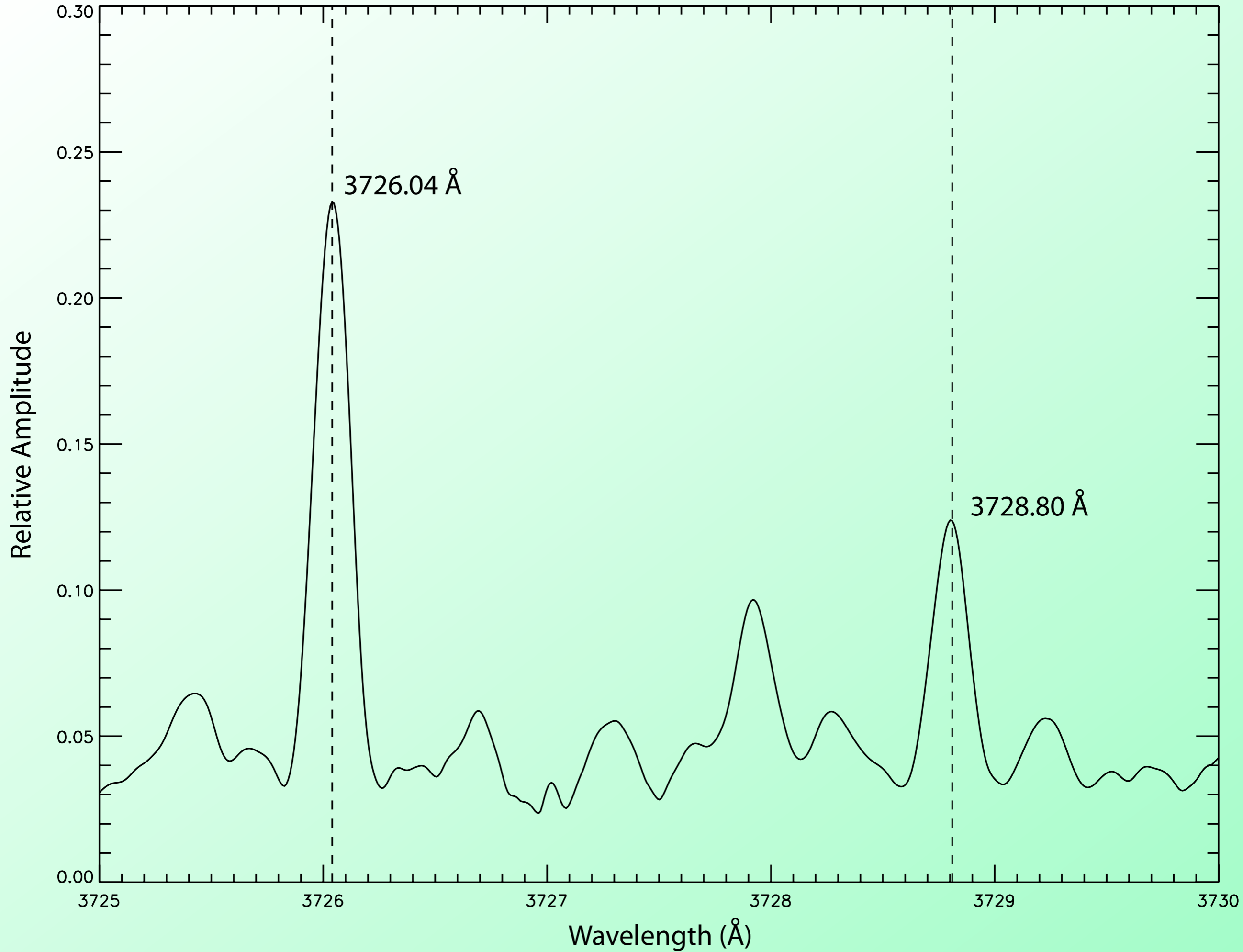
The Spatial Heterodyne Spectrometer (SHS)

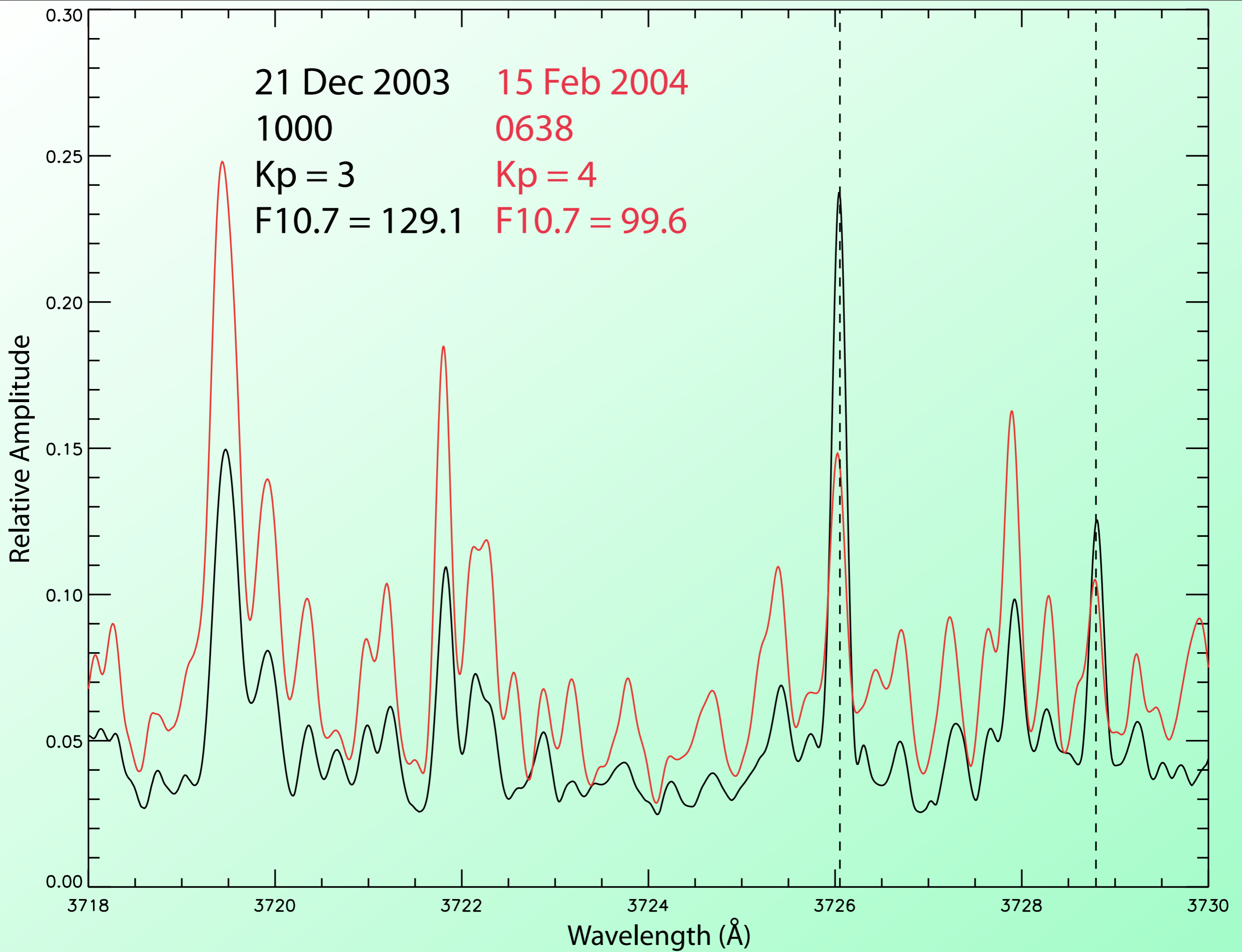
- The SHS is a modified Michelson interferometer
- Replace the mirrors with diffraction gratings
- Allows for higher sensitivity than traditional interferometers in the near UV region

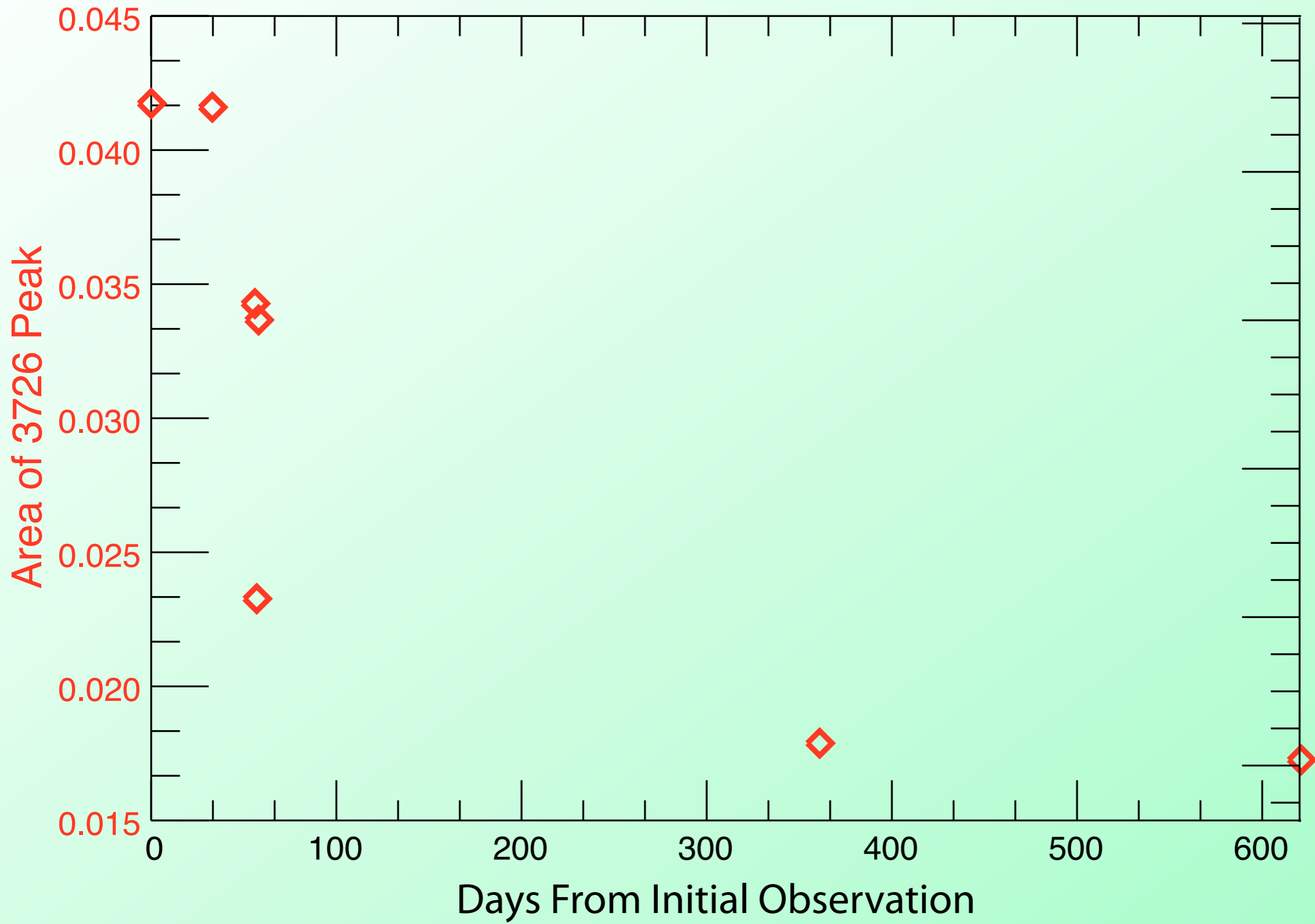


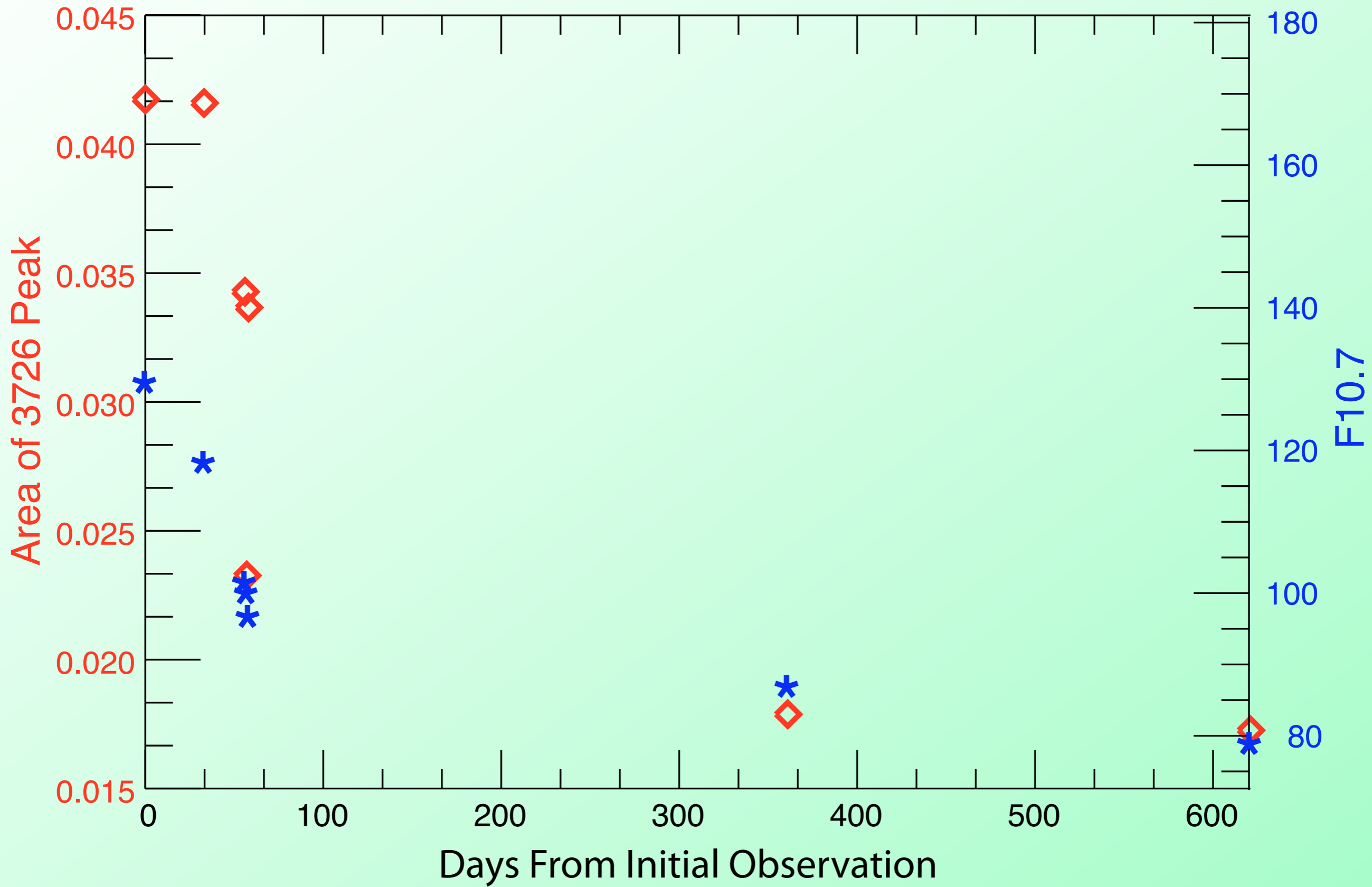
3727 Doublet Observations

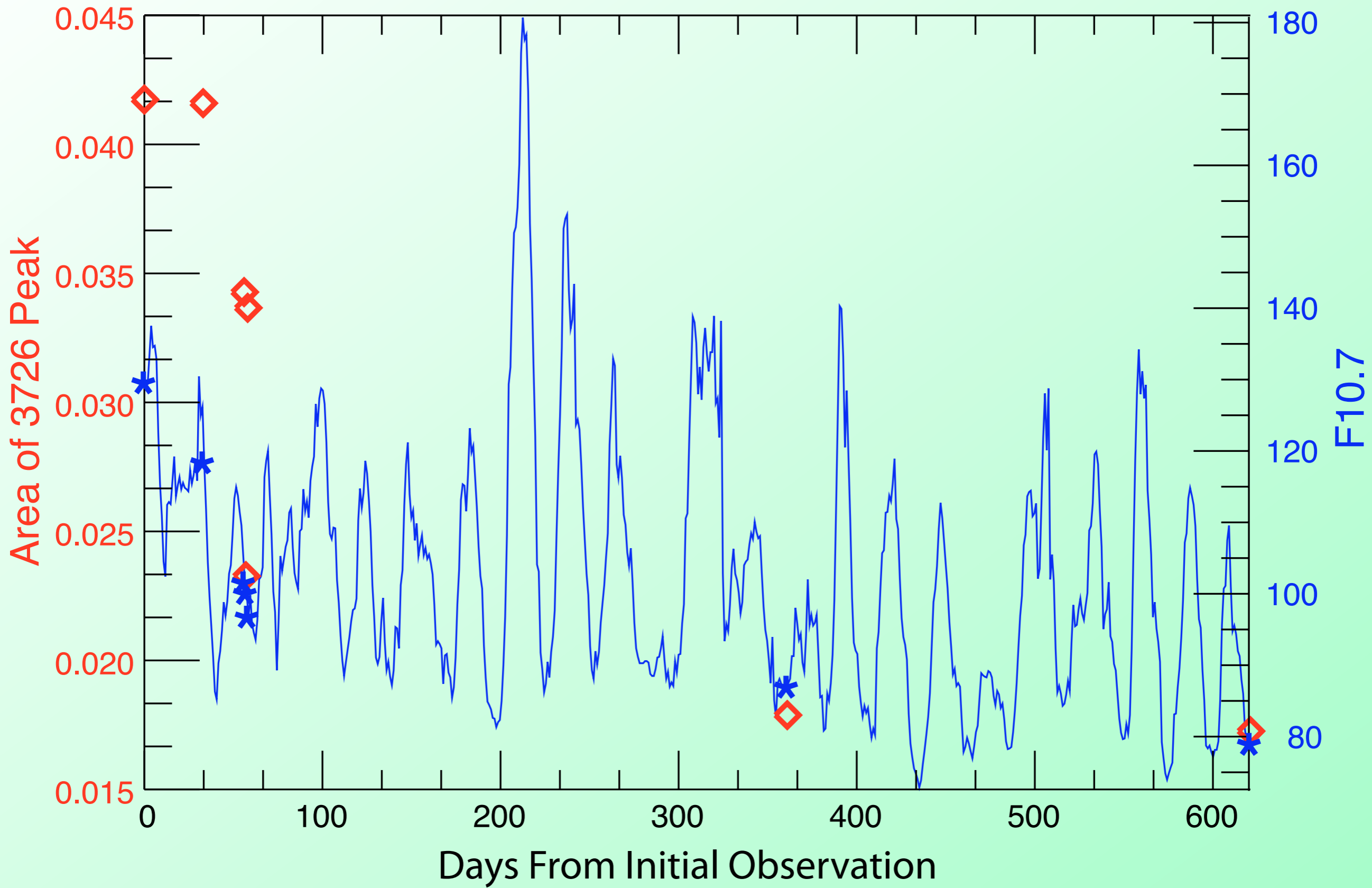
- Observed during galactic O^+ campaign at the Pine Bluff Observatory
- Multiple observations during several periods between December 2003 and October 2005
- Not attributed to any galactic source











Date	Area Ratio (3726/3729)
12/21/03	2.0
1/22/04	2.5
2/14/04	1.9
2/15/04	1.5
2/16/04	2.1
12/15/04	2.3
9/2/05	2.0
10/1/05	1.6

Future Work

- Look at galactic O⁺ observations to “harvest” terrestrial emissions
- Comparison with theoretical reaction rates
- Take future observations to get seasonal and diurnal variations (if they exist)

Conclusions

- 3727Å doublet has been observed with the SHS at the Pine Bluff Observatory
- Emission is concentrated in the F-region of the ionosphere (~250km)
- Variation of intensity has been observed
- Tune in next year for the exciting conclusion!
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