Absorption features in EFOSC2 internal flat spectra

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Internal spectroscopic flats starting at ~ 600 nm show absorptions at 724 and 882 nm (see Fig. 1 and 2). These absorptions are due to water vapor, as Fig. 3 from Kerber et al. (2010, Messenger 141, 9) shows. Figure 4 shows that the absorption feature at 724 nm is relatively stable over time and it does not depend on the relative humidity, so it seems likely that the water vapor is inside the lamp itself. Also the feature was much smaller when the 3.6m-T lamps were used, which are made by a different company. Figure 1 shows that the sky spectrum only has O2 absorption, which excludes that water vapor features are due to ambient humidity.

It should be noted that water vapor could be released by the lamp glass, as the patent says in the abstract (US patent 4463277 A):

> *A compact halogen-cycle type incandescent lamp is provided with an envelope that is composed of a selected hard glass (a borosilicate or an aluminosilicate type glass for example) and then dosed with an amount of bromine which is correlated with the glass composition in such a manner that it counteracts the **deleterious release of water-vapor forming constituents by the glass** envelope when the lamp is energized and the glass is hot.*

Indeed water vapor inside halogen lamps can be measured, as this paper shows: Water vapour density measurement in halogen lamps.

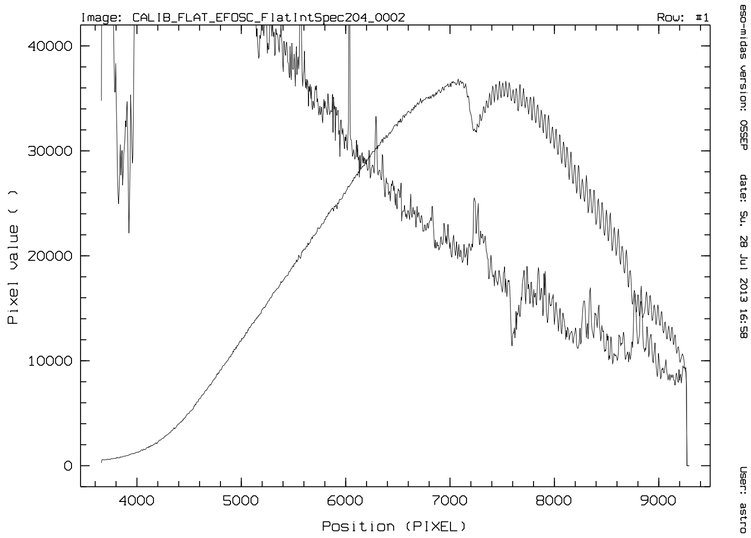

Figure 1: EFOSC2 flat and sky spectra for grism 13. The flat shows water vapor absorptions at 7244 and 8821 Å. For comparison, a sky spectrum is also plotted, which only shows the O2 absorption at 7617 Å, with a FWHM of 76 Å. Note that dividing by the flat introduces artifacts in the sky spectrum at the same wavelength of the absorptions.

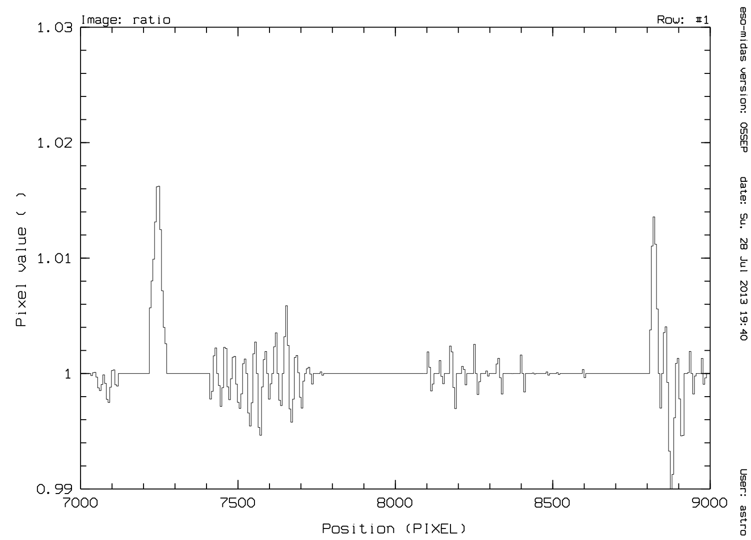

Figure 2: Grism 13 flat divided by median over 20px. The two features at 724 nm and 882 nm are evident.

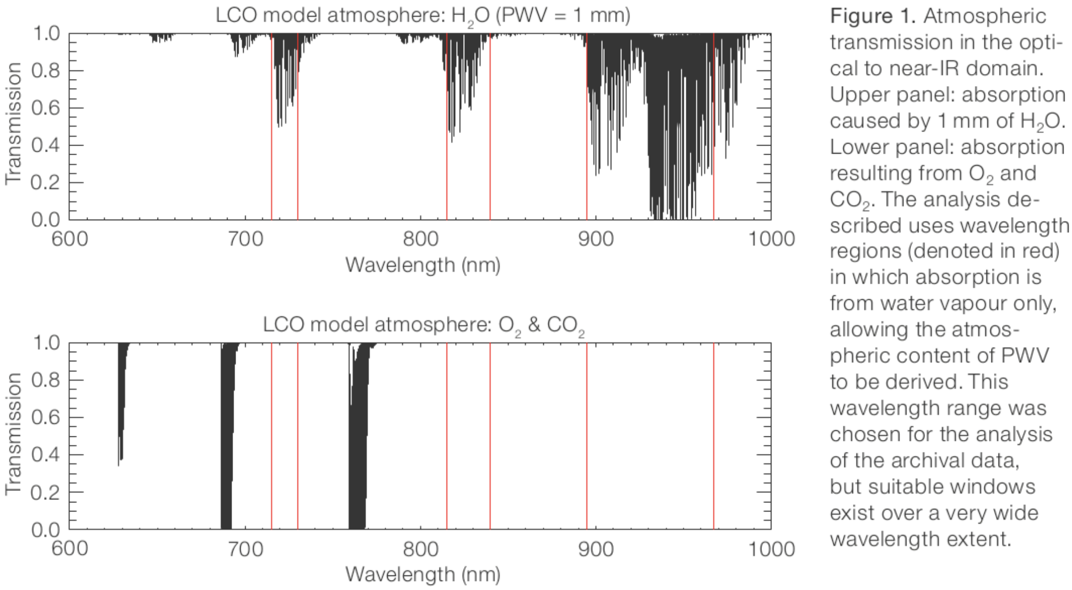

Figure 3: Figure 1 from Kerber et al. (2010).

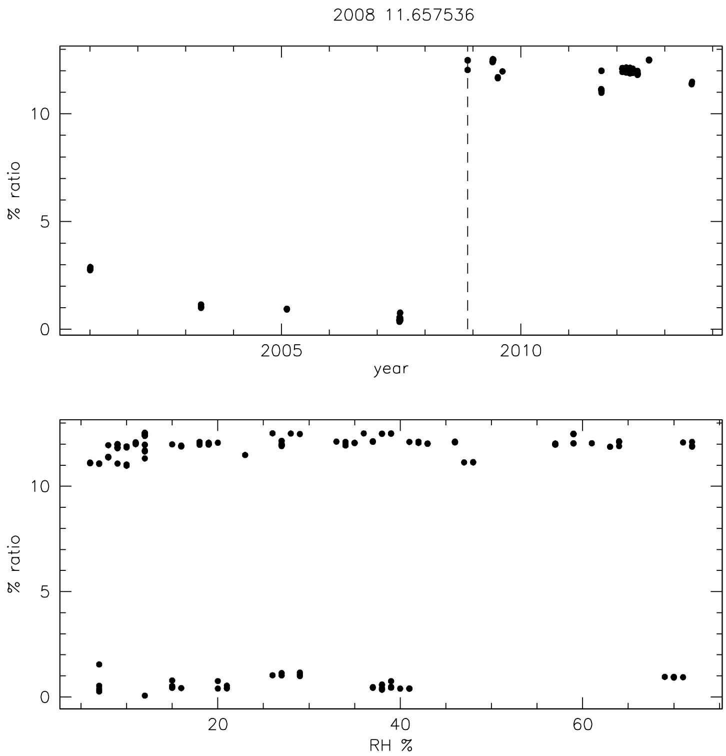

Figure 4: For grism 13, and slit 1″, the panels plot the strength of the water vapor absorption vs. time and vs. relative humidity. The feature was much lower when EFOSC2 was using the 3.6m-T calibration lamps. The absorption strength is measured as the decrease in flux relative to the flux near the absorption.