

Seminar “Ocean, Ice and Atmosphere”,  
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## Retrieval of atmospheric gases (CFC-12 and CO) from digitized historical spectra from 1951 at Jungfraujoch.

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The Sphinx Observatory at Jungfraujoch has played a crucial role in atmospheric research, particularly atmospheric sounding, since its establishment. This research revisits the observatory's groundbreaking work in the 1950s, where a Pfund-type, dispersive spectrometer was employed to capture infrared solar spectra, initially documented on paper rolls. While the primary emphasis was on analyzing the solar atmosphere, these historical spectra now provide a unique insight into the atmospheric composition of the 1950s. Our study has two main objectives. Firstly, we have developed specialized software to digitize and calibrate these historical spectra, making them accessible for contemporary scientific analysis. The digitization error is on average 1.55% and the standard deviation in the wavenumber is about  $0.075\text{ cm}^{-1}$ . Secondly, utilizing these digitized spectra, we have determined the atmospheric concentrations of carbon monoxide (CO) and dichlorodifluoromethane (CFC12) from that period, comparing our results with current model projections. The findings reveal an interesting discrepancy. The observed concentrations of CO were lower than the model predictions. In contrast, CFC12 levels were notably lower than present levels, averaging at  $0.75\text{E}15$  molecules per square centimeter. This precedes James Lovelock's initial detection of CFCs in the 1970s and indicates a minor but detectable presence of CFC12 in the 1950s atmosphere, contrasting sharply with its tenfold increase in modern times. Ongoing endeavors are focused on expanding this analysis to other trace gases, with the aim of enhancing our comprehension of historical atmospheric variations. This study highlights the importance of old data in understanding changes in the atmosphere and the usefulness of modern digital tools in accessing and reanalyzing old scientific data.