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## Line intensity measurements and analysis in the v 3 band of ruthenium tetroxide

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# Line intensity measurements and analysis in the $\nu_3$ band of ruthenium tetroxide ( $\text{RuO}_4$ )

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**J. Vander Auwera** (ULB)

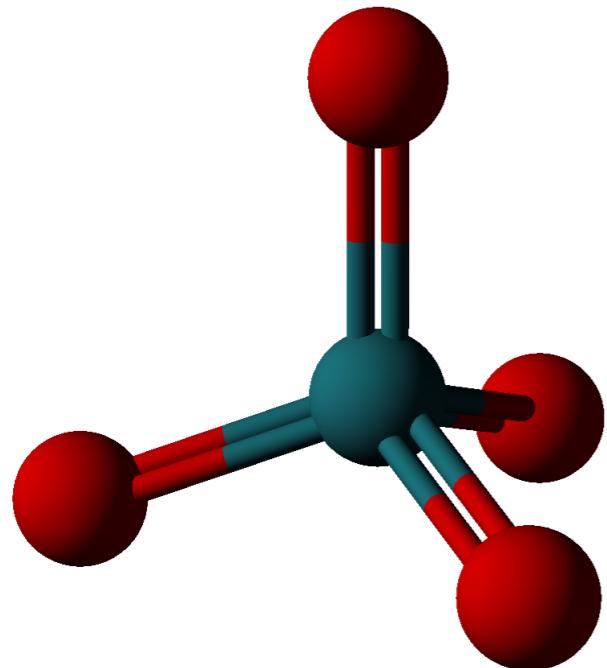
**S. Reymond-Laruinaz** (CEA)

**V. Boudon** (U. Dijon)

**D. Doizi** (CEA)

**L. Manceron** (SOLEIL, UPMC)

# Introduction



- $T_d$  symmetry
- **Natural abundances:**  $^{102}\text{Ru}$  (32%),  $^{104}\text{Ru}$  (19%),  $^{101}\text{Ru}$  (17%),  $^{100}\text{Ru}$  (12%),  $^{99}\text{Ru}$  (13%),  $^{97}\text{Ru}$  (5%),  $^{98}\text{Ru}$  (2%)
- **Radioactive:**  $^{103}\text{Ru}$ ,  $^{106}\text{Ru}$
- Ru = fission product of uranium
- Optical remote sensing of  $\text{RuO}_4$

## Modes of vibration

$$\nu_1(A_1) = 921 \text{ cm}^{-1}$$

$$\nu_2(E) = 314 \text{ cm}^{-1}$$

$$\nu_3(F_2) = 885 \text{ cm}^{-1}$$

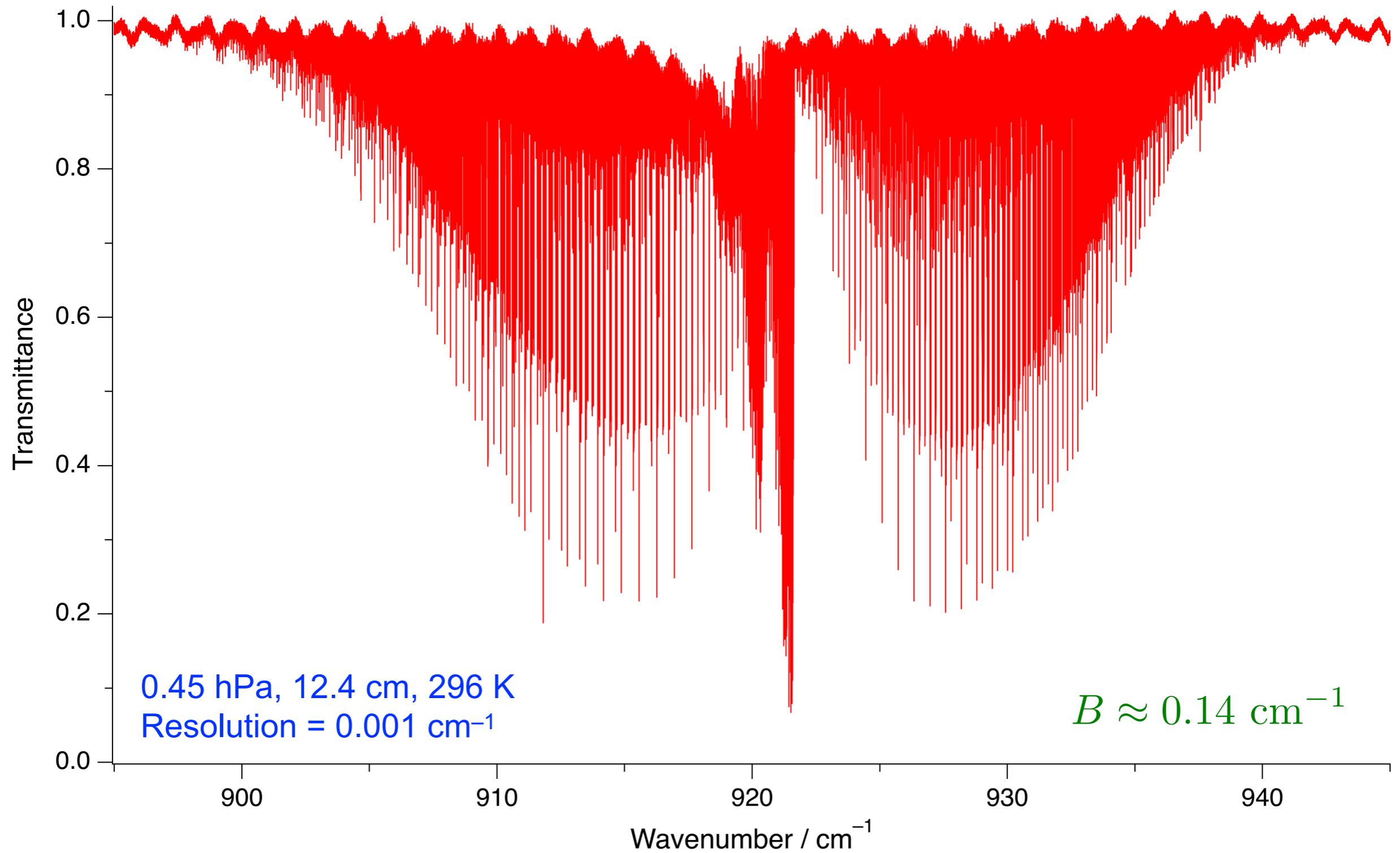
$$\nu_4(F_2) = 336 \text{ cm}^{-1}$$

IR active

Reymond-Laruinaz *et al.*, J Mol Spectrosc 315 (2015) 46

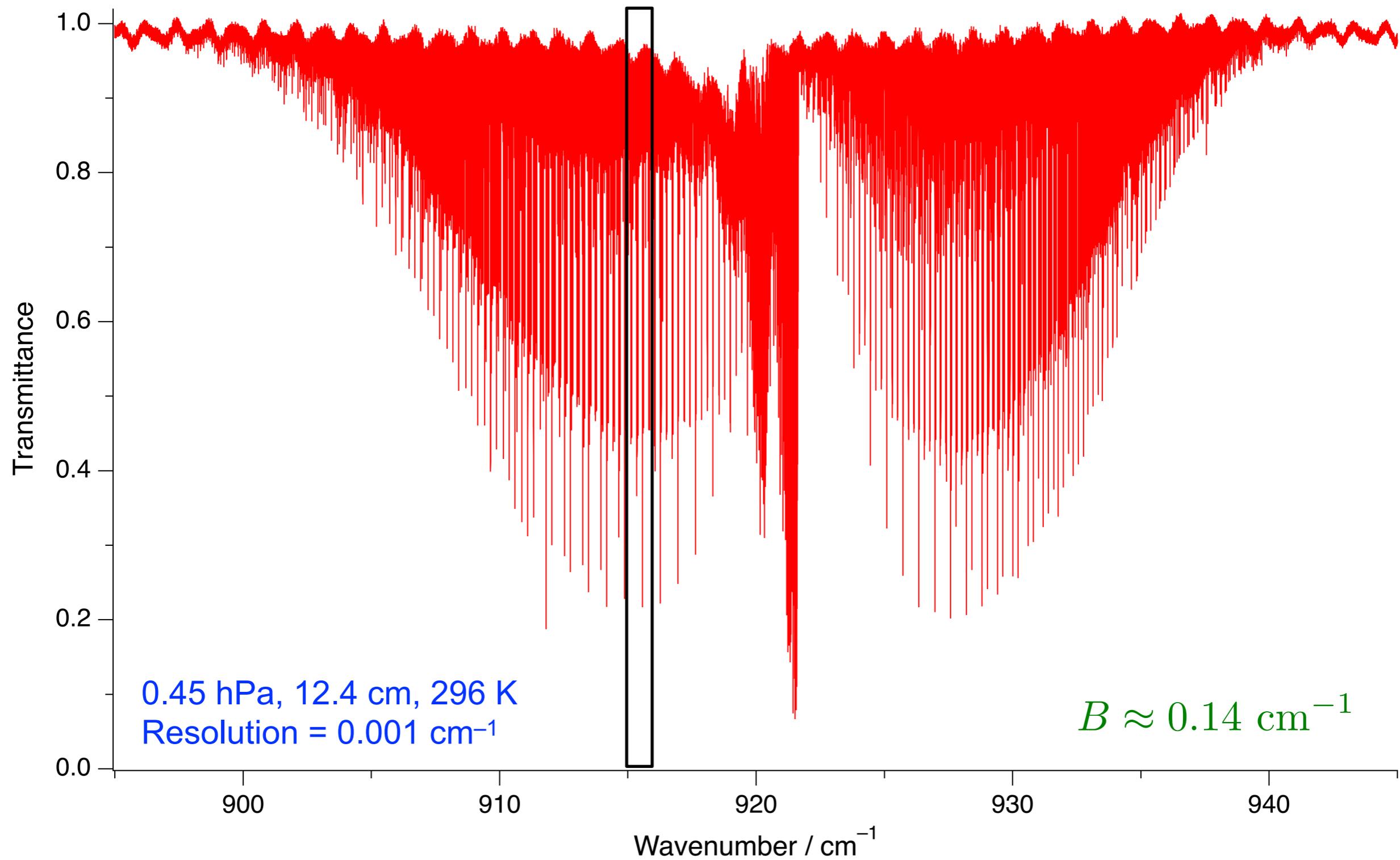
# The $\nu_3$ band of $^{102}\text{RuO}_4$

AILES beamline

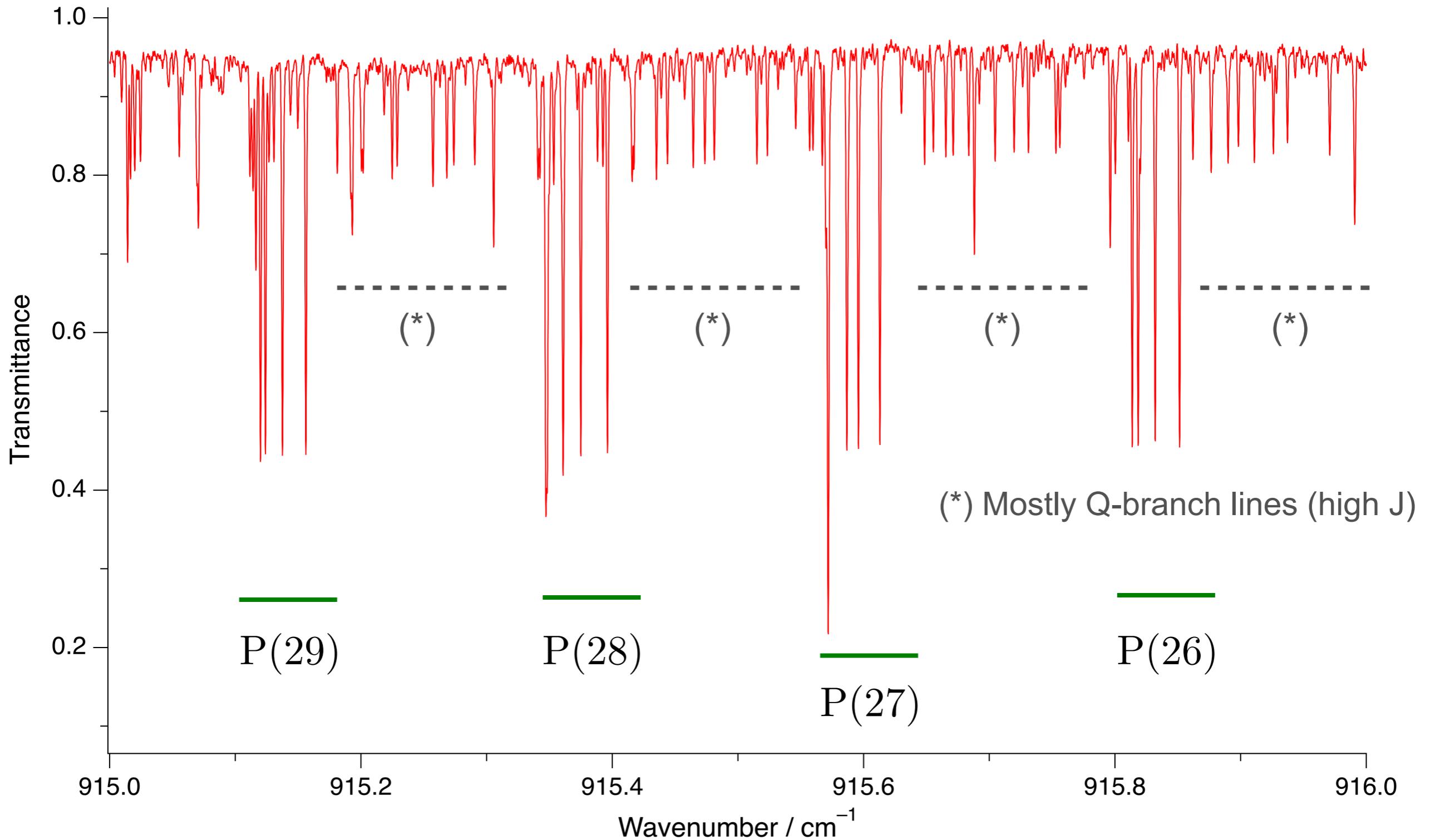


# The $\nu_3$ band of $^{102}\text{RuO}_4$

AILES beamline

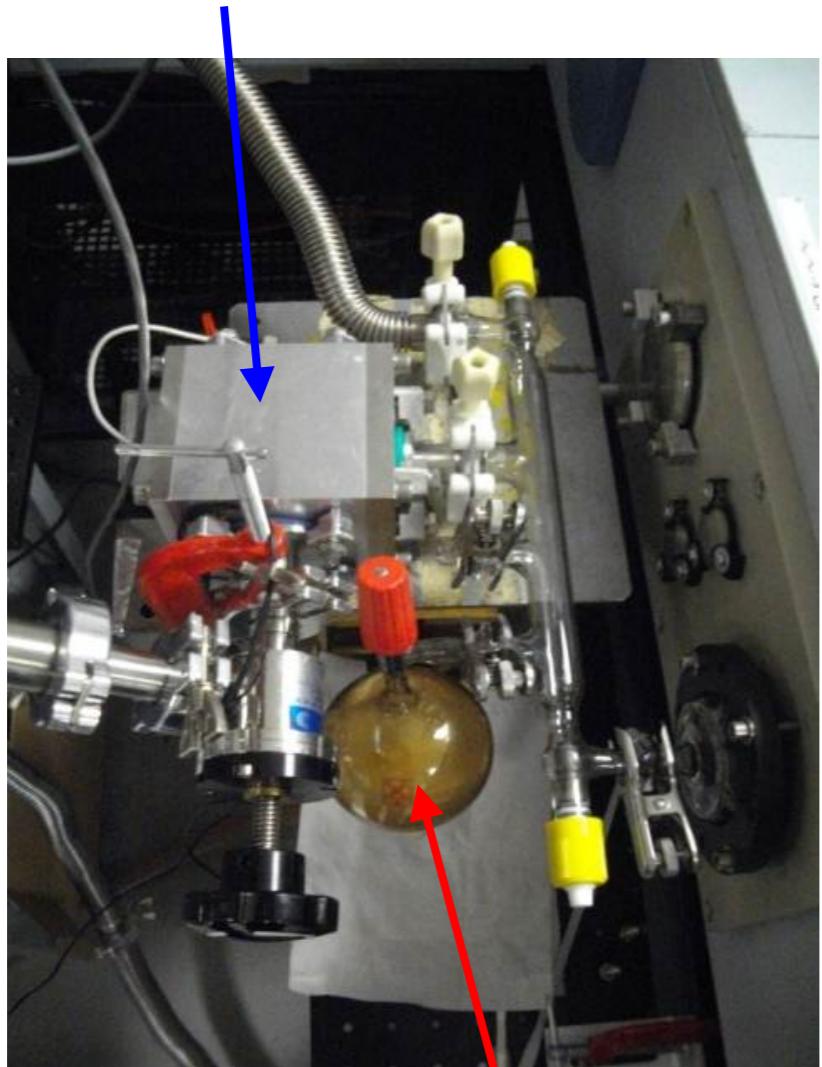


# The $\nu_3$ band of $^{102}\text{RuO}_4$ – *Continued*



# $\text{RuO}_4$ = highly reactive species

Passivated pressure gauge



Glass cell, ZnSe windows (AR coated),  
teflon valves, Kalrez seals,



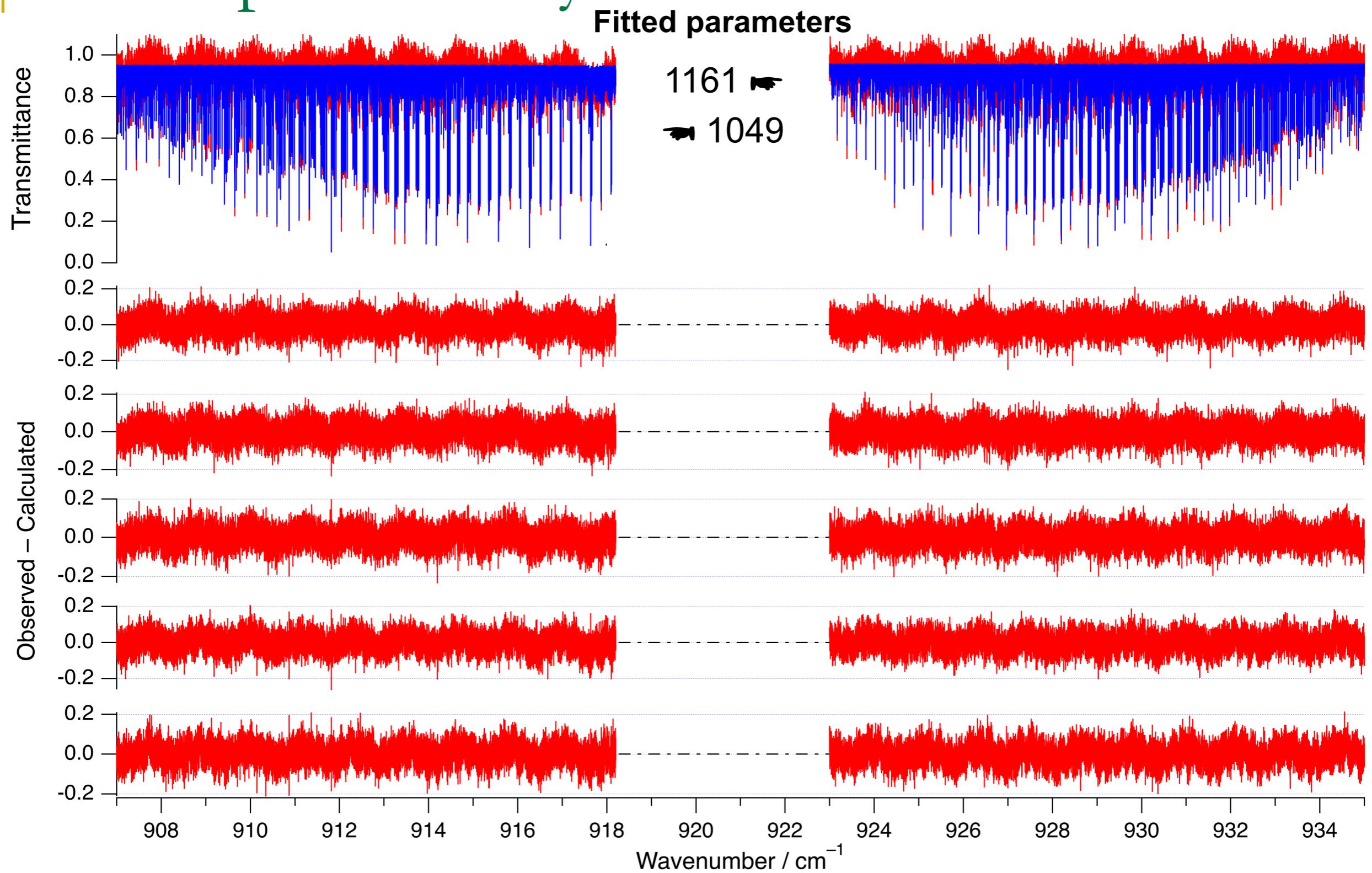
**6 experiments** (12.4 cm, 296 K)

$P_{\text{initial}} = 0.30 - 0.58 \text{ hPa}$

**Acquisition  $\approx 5 - 10$  hours**

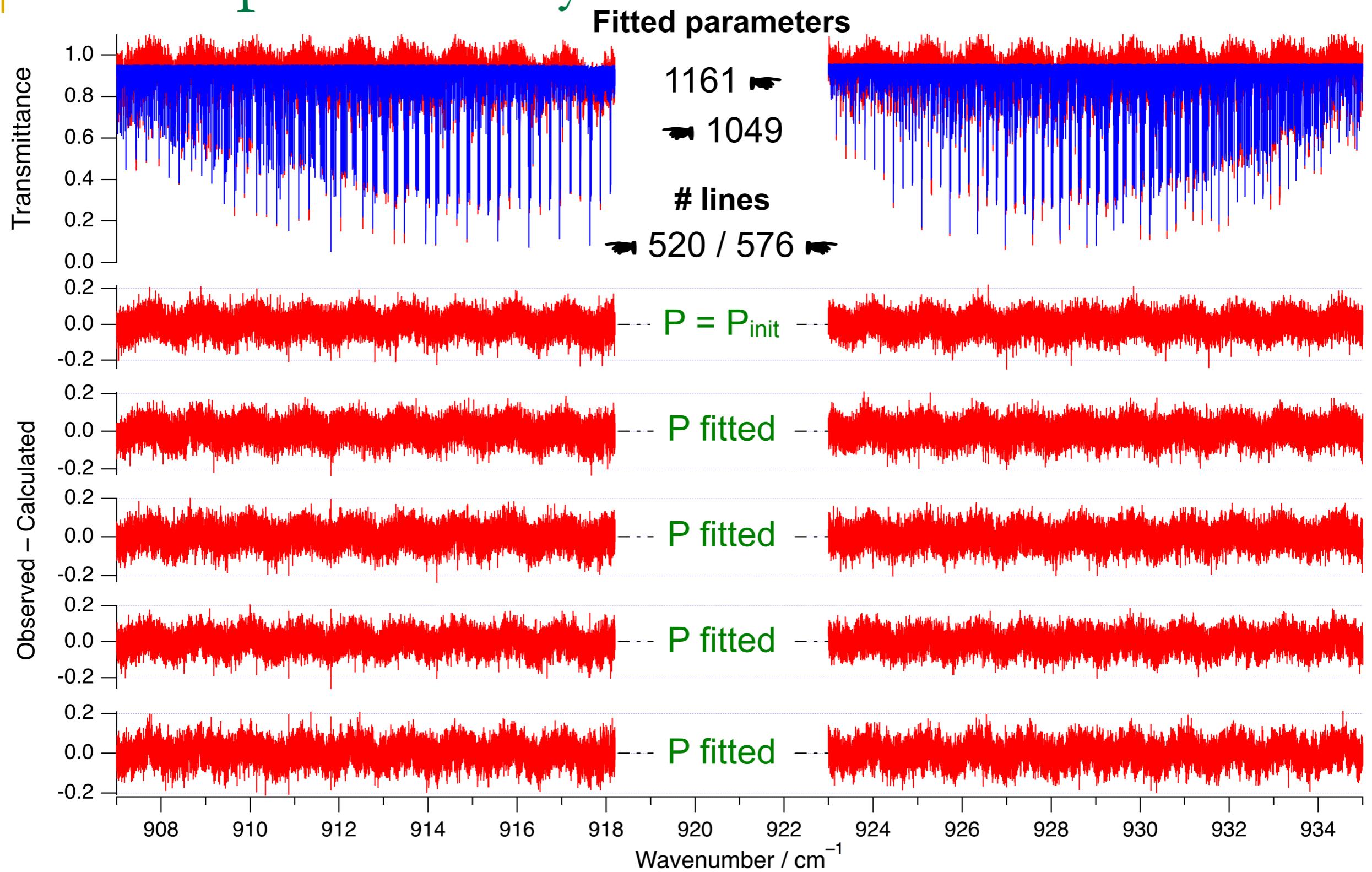
# Multi-spectra analysis

$P_{\text{init}} = 0.42 \text{ hPa}$  [28-11-2014 (b)]



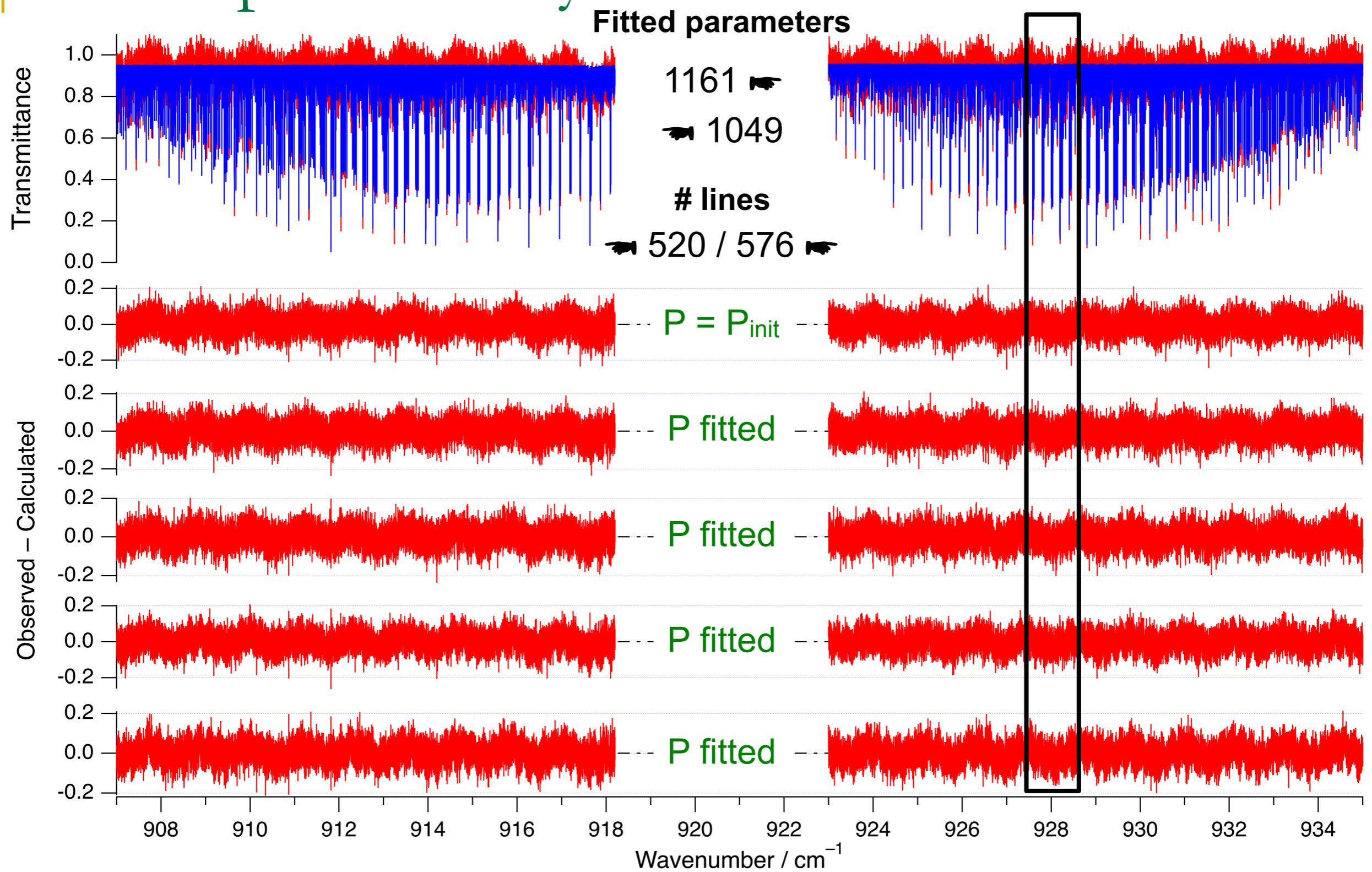
# Multi-spectra analysis

$P_{\text{init}} = 0.42 \text{ hPa}$  [28-11-2014 (b)]



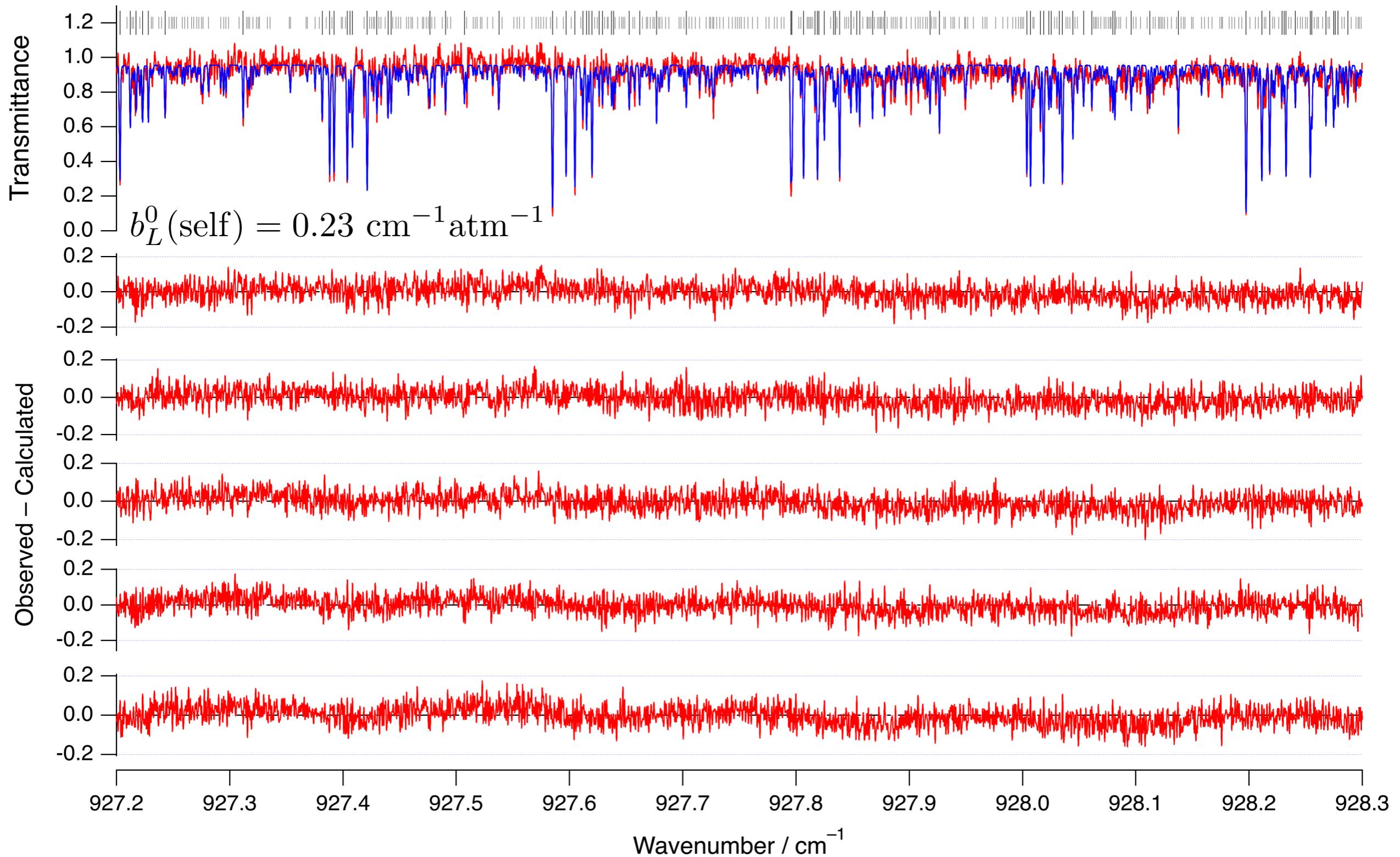
# Multi-spectra analysis

$P_{\text{init}} = 0.42 \text{ hPa}$  [28-11-2014 (b)]

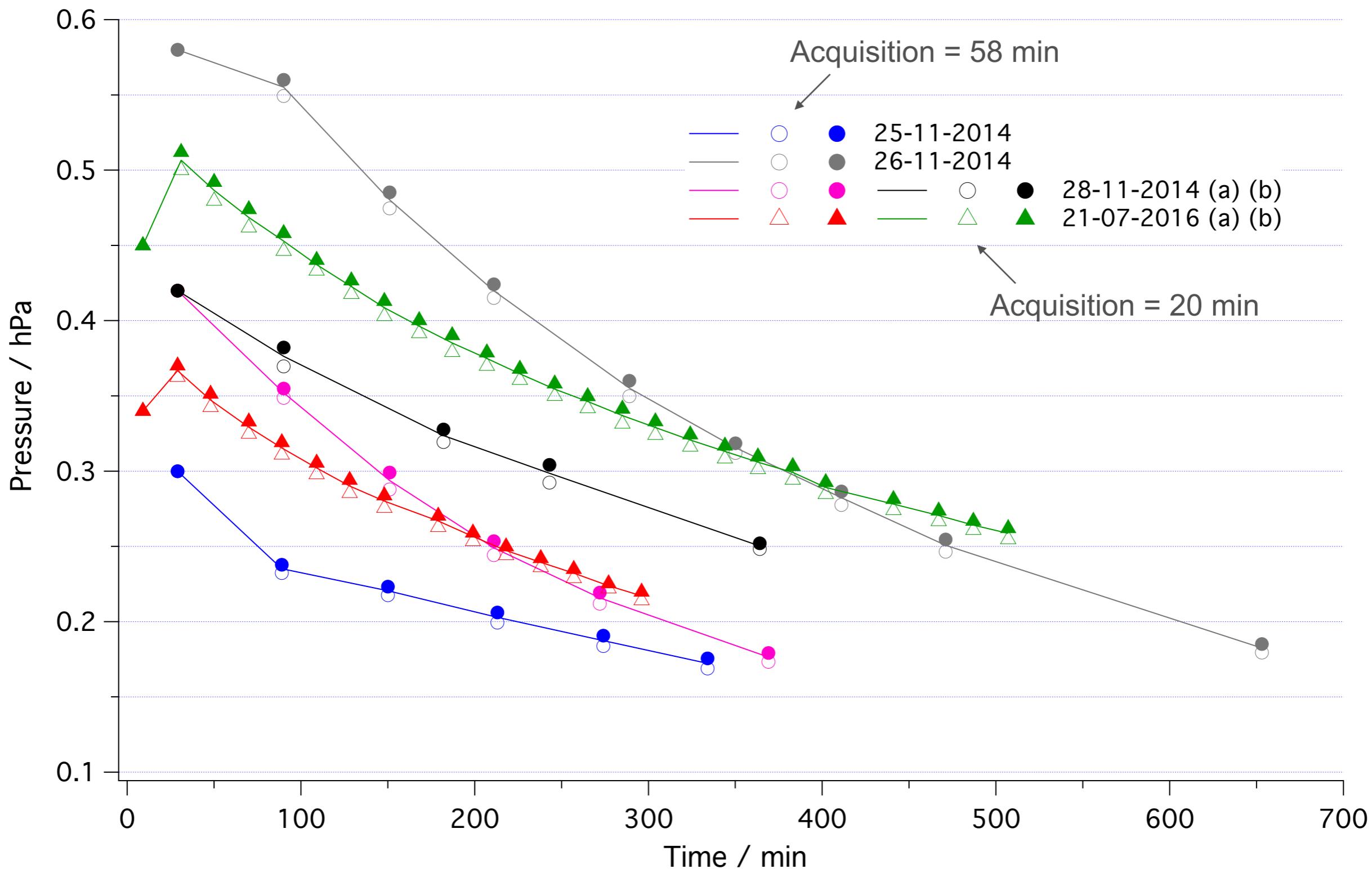


# Multi-spectra analysis (2)

P<sub>init</sub> = 0.42 hPa [28-11-2014 (b)]

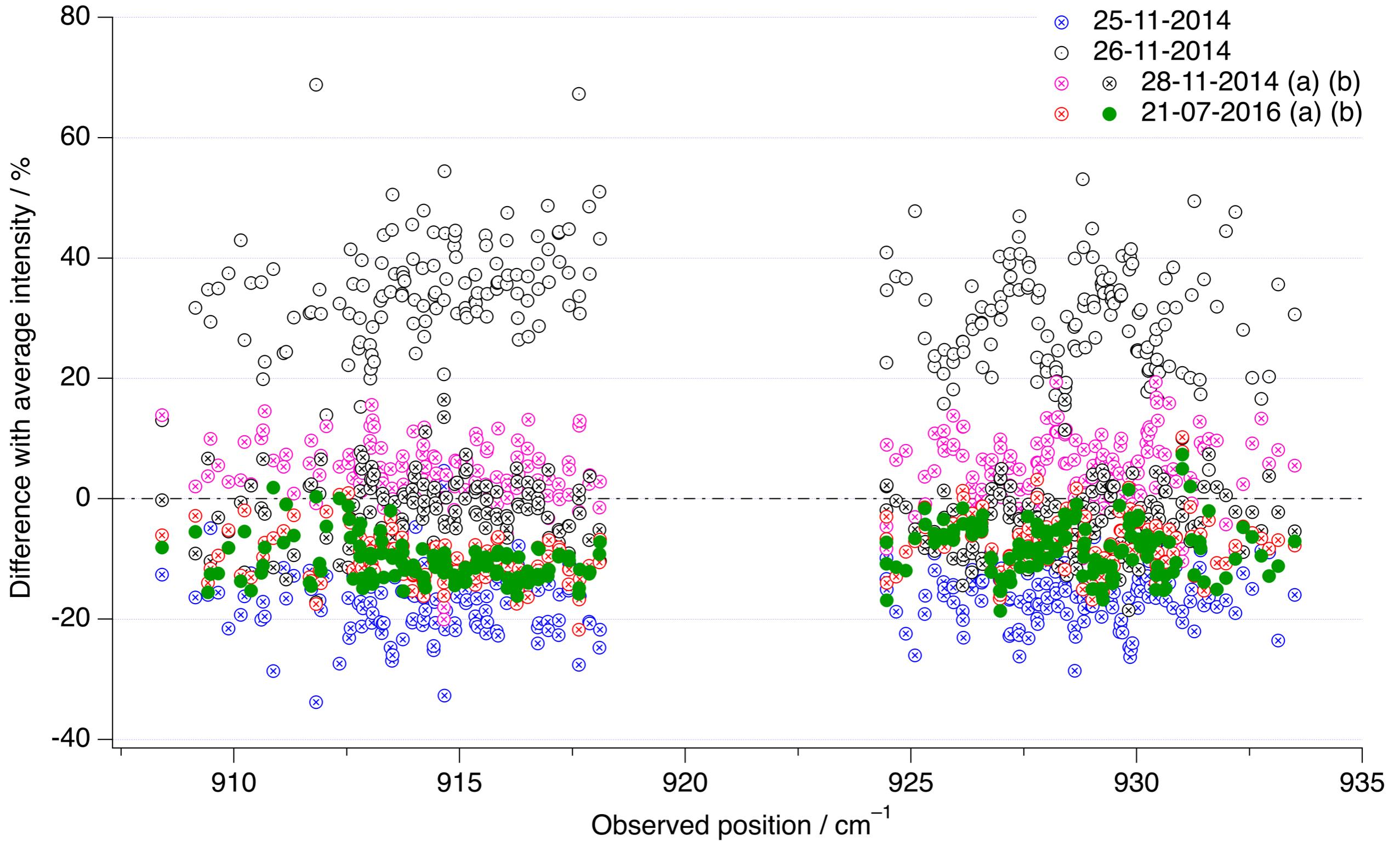


# Evolution of the pressure of $^{102}\text{RuO}_4$

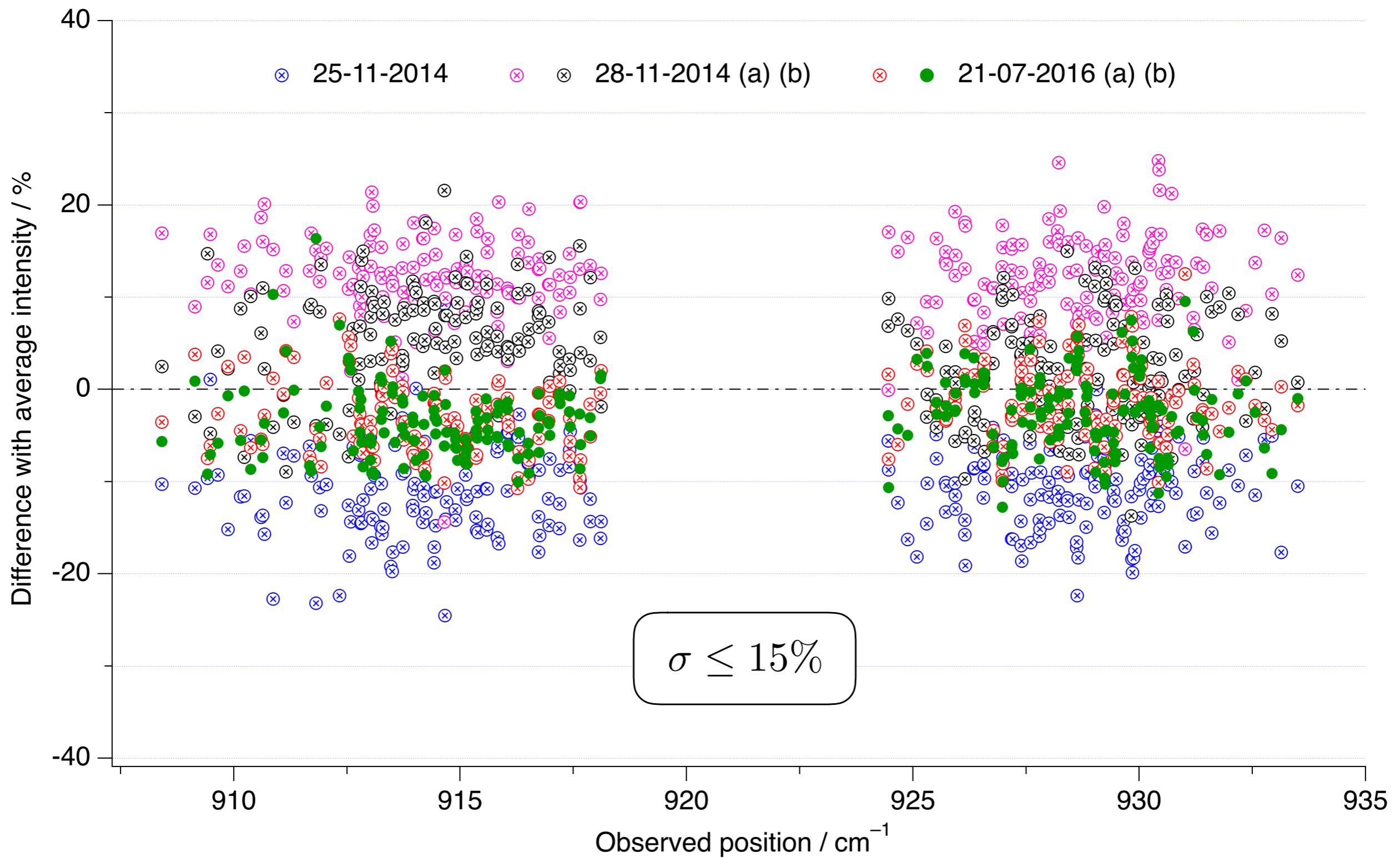


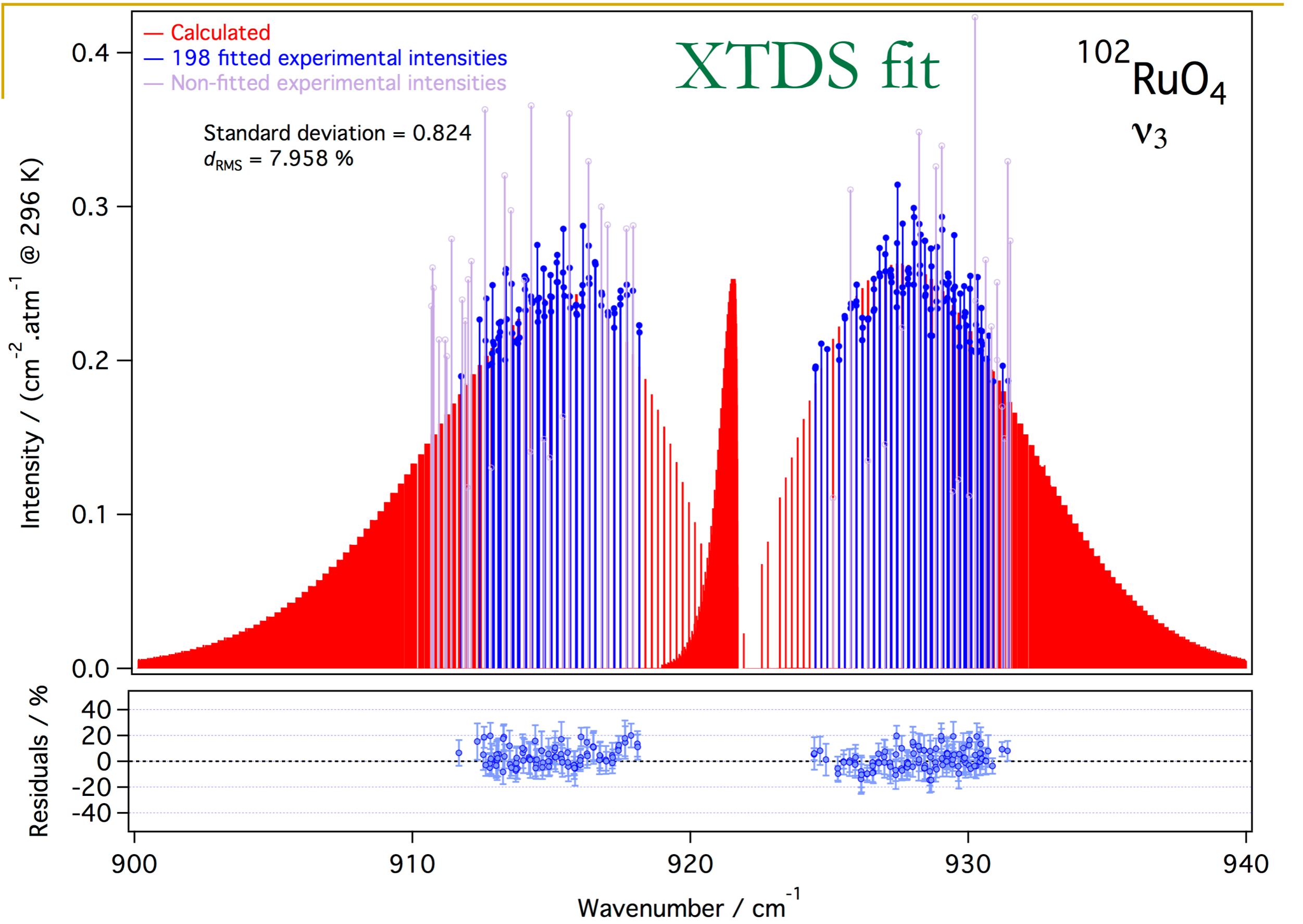
# Measured line intensities

**266 line intensities**  
(measured in the 6 experiments)

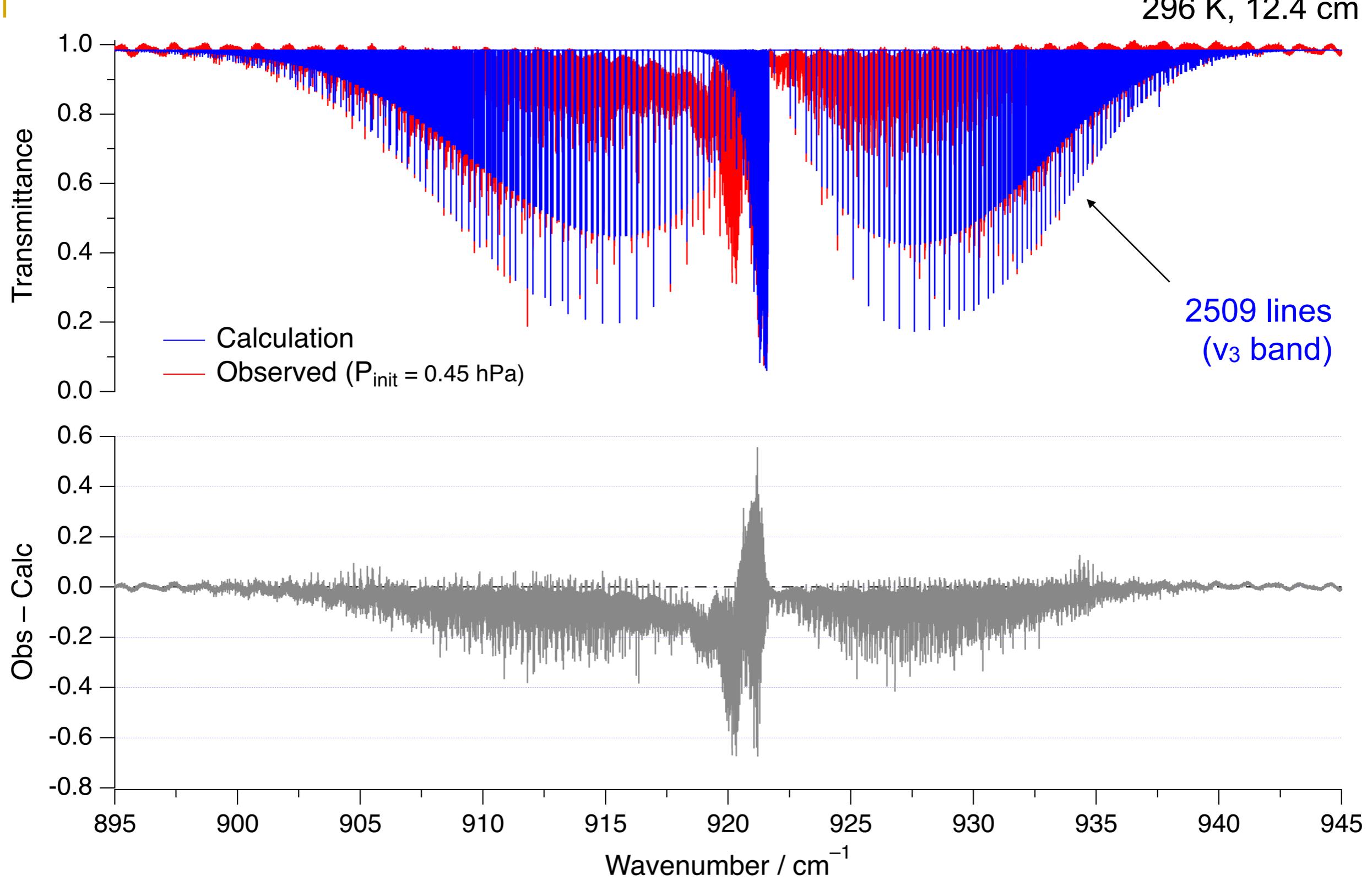


# Measured line intensities – *Continued*

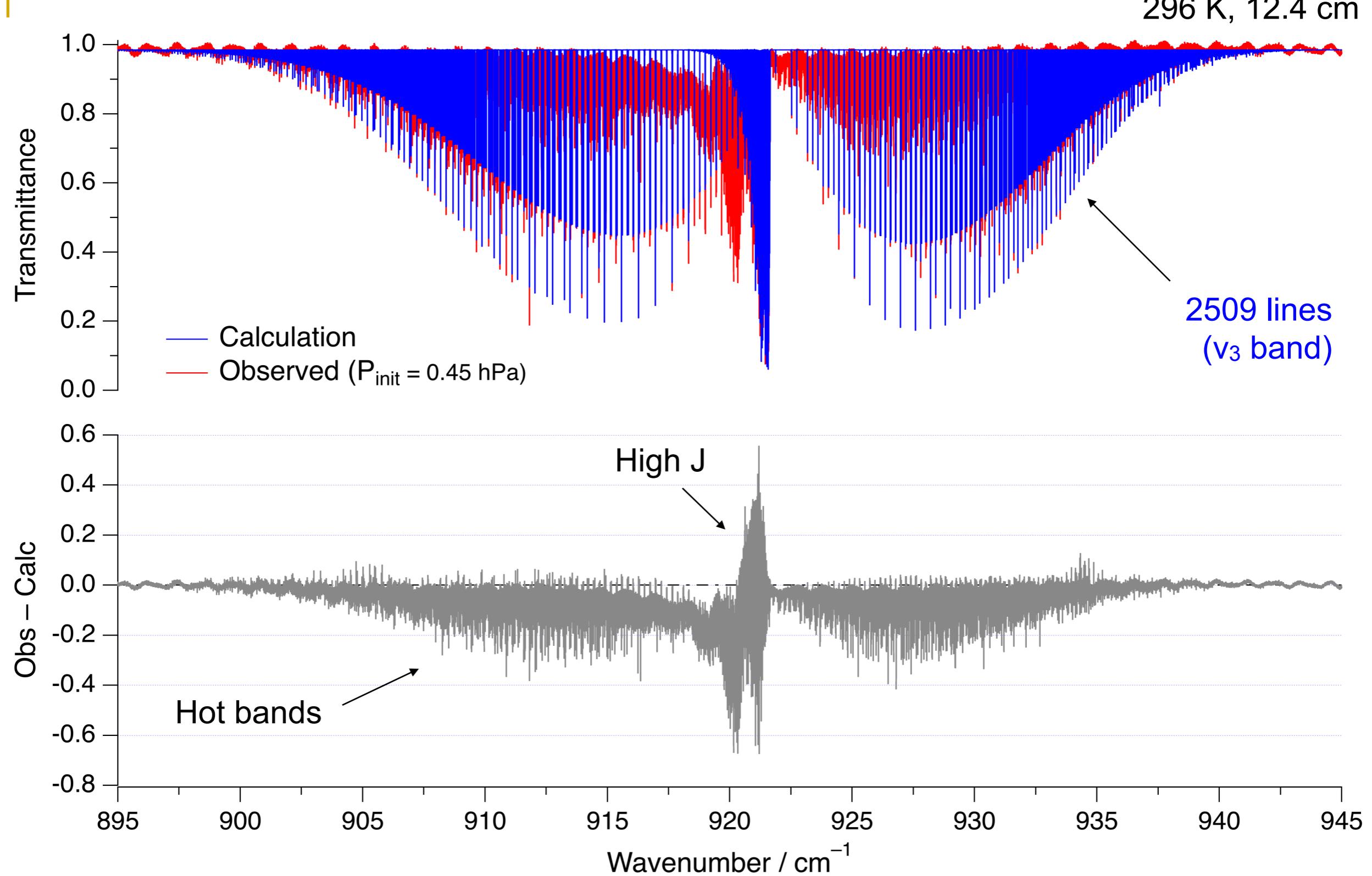




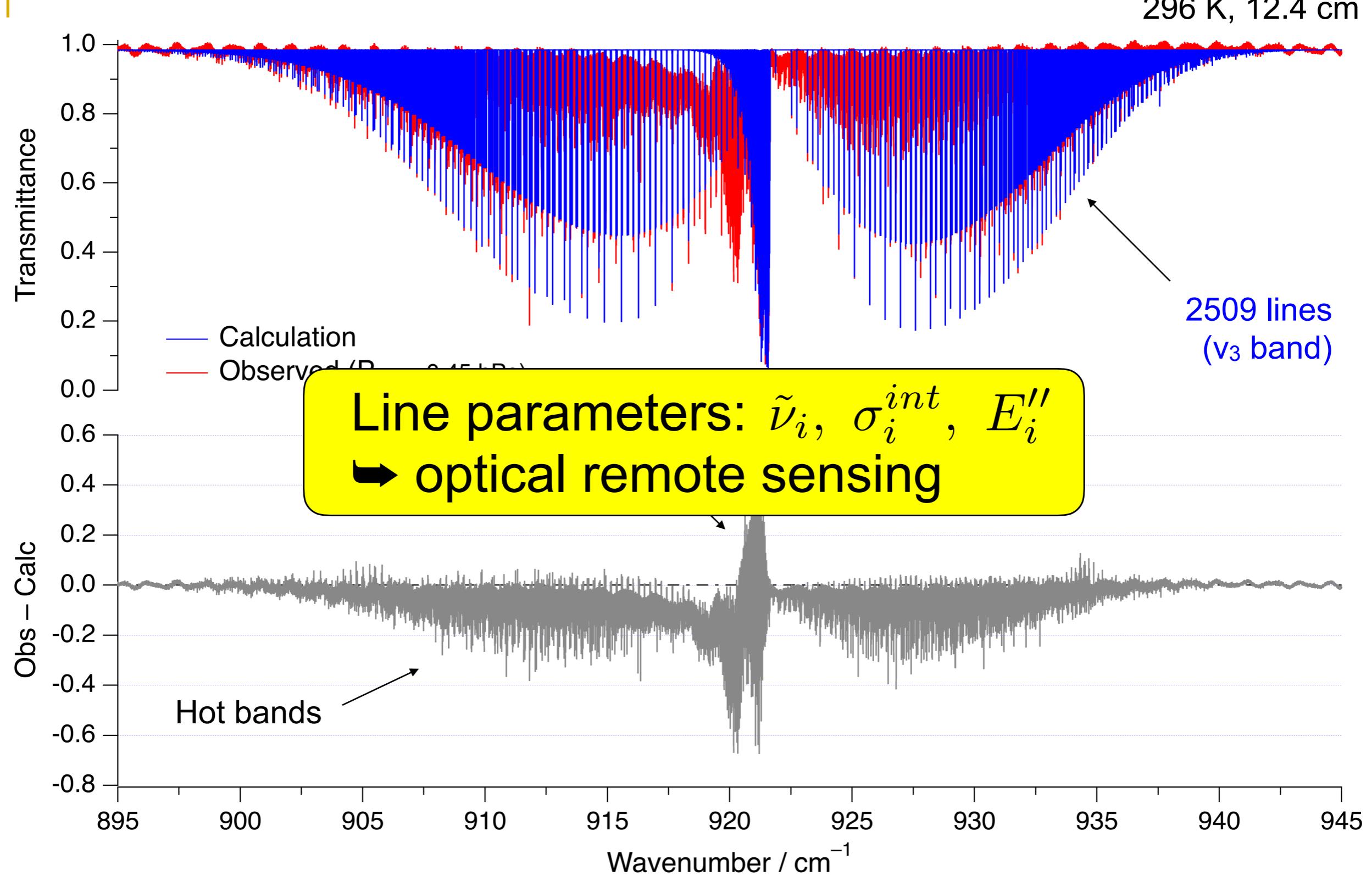
# More work?



# More work?



# More work?





Thank you!