The hydroperoxyl radical \( \text{HO}_2 \) belongs to these trace species of the atmosphere which play a crucial role in the tropospheric chemistry. In particular, it is responsible for the formation of \( \text{OH} \) radicals through the \( \text{HO}_2 + \text{NO} \) reaction, the \( \text{OH} \) radical being the most important oxidant in the troposphere. The detection and quantification of the \( \text{HO}_2 \) radical during laboratory experiments in environmental chambers have been a challenge for a long time due to its short lifetime and consequently weak concentrations.

We have thus developed a new quartz photochemical reactor of 120 L which has been coupled to an \textit{in-situ} cw-CRDS detector in the near IR. Preliminary tests on stable molecules like \( \text{CO} \) (\( \sim 1570 \text{ nm} \)) and \( \text{CH}_2\text{O} \) (\( \sim 1510 \text{ nm} \)) allowed us to determine the absorption sensitivity of the spectrometer. An \( \alpha_{\text{min}} \) of \( 1 \times 10^{-9} \text{ cm}^{-1} \) has been obtained, leading to an \( \text{HO}_2 \) detection limit of about \( 2 \times 10^{10} \text{ molecule cm}^{-3} \) at 6625 cm\(^{-1} \). We then investigated the photolysis of methyl nitrite \( \text{CH}_3\text{ONO} \) at 365 nm:

\[
\begin{align*}
\text{CH}_3\text{ONO} + h\nu & \rightarrow \text{CH}_3\text{O} + \text{NO} \\
\text{CH}_3\text{O} + \text{O}_2 & \rightarrow \text{CH}_2\text{O} + \text{HO}_2 \\
\text{HO}_2 + \text{NO} & \rightarrow \text{OH} + \text{NO}_2
\end{align*}
\]

For the first time, the \( \text{HO}_2 \) radical has been directly observed during the photolysis of \( \text{CH}_3\text{ONO} \). Experiments have been conducted at 50 Torr total pressure and absolute \( \text{HO}_2 \) photostationary concentrations of \((0.8 – 1.5) \times 10^{11} \) molecules \text{cm}^{-3} \) have been determined, depending on the reaction conditions. The simultaneous measurements of the products (\( \text{NO}_2 \) and \( \text{CH}_2\text{O} \)) in the same wavelength region allow us to simulate the explicit chemical mechanism. The obtained results will be discussed and the perspectives in term of use of this new setup will be presented.