Vibrational spectroscopy of NO$^+(\text{H}_2\text{O})_n$: Evidence for the intracluster reaction NO$^+(\text{H}_2\text{O})_n \rightarrow \text{H}_3\text{O}^+(\text{H}_2\text{O})_{n-2}$ (HONO) at $n \geq 4$

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Infrared spectra of mass-selected clusters NO$^+(\text{H}_2\text{O})_n$ for $n=1$ to 5 were recorded from 2700 to 3800 cm$^{-1}$ by vibrational predissociation spectroscopy. Vibrational frequencies and intensities were also calculated for $n=1$ and 2 at the second-order Möller-Plesset (MP2) level, to aid in the

![Diagram of NO$^+$ molecule with angles and bond lengths marked: N-O bond length 1.107 Å, N-N bond length 2.318 Å, N-H bond lengths 0.965 Å, and O-H bond lengths 0.965 Å.]

Each H$_2$O donates a lone pair to one of the empty 2$\pi^*$ MO's on NO$^+$

![Handwritten note: Each H$_2$O donates a lone pair to one of the empty 2$\pi^*$ MO's on NO$^+$.]