INTERACTING HIGH-LYING ROTATIONAL LEVELS OF WATER

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With the goal of understanding the effects of the anomalous centrifugal distortion displayed by the water molecule, emission spectra of methane-oxygen low-pressure flames have been used to retrieve rotational energies for an extended set of vibrational states belonging to this molecule. In this talk only the rotational levels pertaining to the ground and (010) vibrational states will be discussed. Experimental energies, along with their uncertainties, were derived up to $J = K_a = 25$ in the former state and up to $J = K_a = 21$ in the latter. The theoretical treatment developed to account for anomalous centrifugal distortion effects[a] has been used to fit the new values of the rotational energies. It has been possible to satisfactorily reproduce the experimental energies for the two vibrational states, and this provided a check for the accuracy of the observed rotational energies. This analysis also revealed strong accidental resonances between rotational levels of the (010) state and those of the first triad. Unlike the strong accidental resonances already evidenced in the water molecule,[b] these resonances occur between two different polyads. These new results will be discussed in the paper and we will explain why the theoretical model[a] used for the analysis of the (000) and (010) states may need to be altered when applied to fitting a larger set of rotational levels.

[a] L. H. Coudert, *J. Molec. Spectrosc.* **181,** 246 (1997).
[b] C. Camy-Peyret and J.-M. Flaud, *J. Molec. Spectrosc.* **59,** 327 (1976).