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Dense gas and chemical variations in the Ophiuchus B core

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Abstract. The nearby Ophiuchus molecular cloud is an ideal target to study the process of star formation on small scales. Dust continuum emission maps of the region reveal a highly fragmented complex, with both pre-protostellar and protostellar sources detected in each of its 10 dense cores. Ophiuchus B is the brightest Oph core in the submillimetre after the well-studied Ophiuchus A core, containing approximately 50 $M_\odot$ of gas and dust with no known protostellar objects. Taking the distribution of submillimetre continuum within the core as a guide, we have further mapped Oph B in the NH_3 (1,1) and (2,2) inversion lines using the Australia Telescope Compact Array. We present the first results from these high spatial and spectral resolution observations. Peaks of NH_3 emission are mainly found within the extended dust structure but many have no clear peak counterpart in the continuum emission. Additionally, the brightest peak of the continuum emission in Oph B (consequently with high column density) is not coincident with a bright NH_3 emission peak. We have also mapped Oph B in the N_2H^+ (1-0) transition using BIMA, and have recently completed high resolution, more sensitive pointed observations on the N_2H^+ peaks found in the BIMA map at the ATCA. Preliminary N_2H^+ results reveal similar discrepancies between the N_2H^+ and continuum emission. Most strikingly, while the NH_3 and N_2H^+ emission are largely correlated, we still find N_2H^+ peaks offset from the NH_3. These results are intriguing given that, in isolated cores, NH_3 and N_2H^+ are found to trace each other and the continuum emission well. These observations suggest that chemical differentiation is at play, possibly due to differing levels of freeze-out onto dust grains as a result of differing internal conditions that may precede star formation.

Keywords. astrochemistry, stars: formation, ISM: dust, extinction, molecular processes