Geophysical Research Abstracts
Vol. 16, EGU2014-1175, 2014
EGU General Assembly 2014

Ion cyclotron waves during the Rosetta approach phase: a magnetic estimate of cometary outgassing

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A theoretical model for the ion cyclotron wave generation during the approach phase of Rosetta to 67P/Churyumov–Gerasimenko is presented. For various activity levels of the comet, the crossing of the observational threshold is determined, whose level is derived from the wave power in the undisturbed solar wind near the comet's location during the approach phase at the appropriate frequency. The Giotto flyby at 27P/Grigg–Skjellerup is used to obtain an estimate of how often water-group ion cyclotron waves are observed, and to get insight into the wave forms. At 67P/Churyumov–Gerasimenko one can expect to observe water-group ion cyclotron waves already at a distance of 600.000 km from the nucleus for a nominal outgassing rate of $Q = 350 \times 10^{23}$ molecules per second. The observed first location of cyclotron waves during the Rosetta approach phase will give an indication of the actual outgassing rate of the comet.