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Evidence of ion-cyclotron resonance heating of solar wind alpha particles

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We show evidence for the ion-cyclotron-wave dissipation mechanism acting in the solar wind plasma by use of Helios data. We find that the wave power of the small-scale transverse waves within the inertial range correlates with both, the proton temperature anisotropy, $T_\perp/T_\parallel$, and the normalized differential speed, $V_{\alpha p}/V_A$, between alpha particles and protons. Furthermore, when this relative speed stays below 0.5, then the alpha-particle temperature anisotropy correlates positively with the relative power of the transverse waves. However, if $V_{\alpha p}/V_A$ is larger than 0.6, then the alpha-particle temperature anisotropy tends to decrease towards values below unity, despite the presence of transverse waves with relatively large amplitudes. Our findings are in good agreement with theoretical predictions of kinetic theory for the resonant interaction of ions with Alfvén-cyclotron waves and for the resulting wave dissipation.