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Non linear versus dissipation effects in large amplitude magnetosonoic waves : a parametric analysis

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The dynamics of large amplitude magnetosonic waves is analyzed with the help of $1-D$ full particle electromagnetic simulations where both ions and electrons are used as individual particles. The competition between nonlinear effects (wave steepening) versus dissipation effects (responsible for wave damping) is reviewed in details via a parametric study within the frequency range $\omega_{ci} < \omega < \omega_{lh}$, where ω_{ci}, ω, ω_{lh} are respectively the ion cyclotron, the pump wave and the lower hybrid frequencies. For strictly perpendicular propagation, a strong ion heating is observed for low frequencies and is associated with a well coherent and large gyromotion of accelerated ions (formation of a narrow ring). This heating decreases as the frequency tends to the lower hybrid frequency, in association with a loss of the coherent ion motion (no ring). This parametric analysis is extended to oblique propagation, evidencing that electrons and ions are strongly energized respectively along directions parallel and perpendicular to the magnetic field within a certain angular range. The partition of energy available respectively for ions and electrons leads to a modulation of maxima ion/electron temperatures as the angle varies from 90°. Results will be summarized in terms of best heating efficiency.