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Growth of EMIC Waves Using the Observed Non-Maxwellian Ion Velocity Distribution from Space Plasmas

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In space plasmas, such as solar wind and Earth's magnetosphere, electromagnetic ion cyclotron (EMIC) waves are found to be one of the major wave modes. It is well well-known that the enhancement of ion temperature anisotropy provides a promising condition for the growth of EMIC waves. Many studies have been devoted to calculating the EMIC growth rate assuming a bi-Maxwellian ion velocity distribution function. To investigate the accuracy of this assumption, we compute the EMIC growth rate by using the observed ion velocity distributions. We found that growth rates, computed by employing the actual distributions, are often very different from a bi-Maxwellian distribution. We found that much stronger growth rates are obtained for the actual non-Maxwellian distribution than the bi-Maxwellian distribution. Our calculations using the observed ion distribution function emphasize the need to use realistic distributions when modeling EMIC wave excitation.