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Dependence of the amplitude of magnetosonic waves on the solar wind and AE index using Van Allen Probes

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We present the dependence of the magnetosonic wave amplitudes both outside and inside the plasmapause on the solar wind and AE index using measurements made from Van Allen Probe-A spacecraft during the time period of October 1, 2012 - December 31, 2015, based on a correlation and regression analysis. Solar wind parameters considered are the southward interplanetary magnetic field (IMF BS), solar wind number density (NSW) and bulk speed (VSW). We find that the wave amplitudes outside (inside) the plasmapause are well correlated with the preceding AE, IMF BS, and NSW with time delays, each corresponding to 3-4 h (2-3 h), 4-5 h (2-3 h), and 1-2 h (4-5 h), while the correlation with VSW is unambiguous only inside the plasmapause. As measured by correlation coefficient, the IMF BS is the most influential solar wind parameter that affects the variation of dayside wave amplitudes both outside and inside the plasmapause, while NSW and VSW are contributing to the local enhancement of wave amplitudes, respectively, on the duskside outside the plasmapause and pre-noon sector inside the plasmapause. The AE effect on wave amplitudes is comparable to that of IMF BS. More interestingly, regression with time histories of solar wind and AE index preceding the wave measurements outside the plasmapause shows significant dependence on the IMF BS (and AE) and NSW: the region of peak coefficients is changed with time for IMF BS (and AE), while isolated peak around duskside remains unchanged with time for NSW. This implies different origins of magnetosonic wave activity. In addition, the regression with magnetosonic waves inside the plasmapause shows high coefficient around pre-noon sector with preceding IMF BZ and VSW, which suggests a possibility that the pre-noon sector waves outside the plasmapause penetrate into the plasmapause and provide the source of waves inside the plasmapause.