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Mirror mode waves in Venus's magnetosheath: solar minimum vs. solar maximum

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Abstract

The observational rate of mirror mode waves in Venus's magnetosheath for solar maximum conditions is studied and compared with previous results for solar minimum conditions. It is found that the number of mirror mode events is approximately 14% higher for solar maximum than for solar minimum. A possible cause is the increase in solar UV radiation, ionizing more neutrals from Venus's exosphere and the outward displacement of the bow shock during solar maximum. Also, the solar wind properties (speed, density) differ for solar minimum and maximum. The maximum observational rate, however, over Venus's magnetosheath remains almost the same, with only differences in the distribution along the flow line, as shown in Figure 1. This may be caused by the interplay of a decreasing solar wind density and a slightly higher solar wind velocity for this solar maximum. The distribution of strengths of the mirror mode waves is shown to be exponentially falling off, with (almost) the same coefficient for solar maximum and minimum. The plasma conditions in Venus's magnetosheath are different for solar minimum as compared to solar maximum. For solar minimum, mirror mode waves are created directly behind where the bow shock will decay, whereas for solar maximum all created mirror modes can grow.

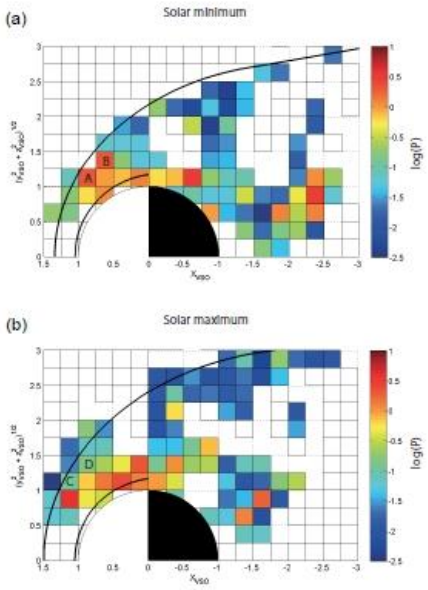

Figure 1: Comparison of the observational rate P of MM waves in Venus's magnetosheath for solar minimum (top) and solar maximum (bottom). The two thick black curves in each panel show the location of the model ionosphere and model bow shock.

References

[1] Volwerk, M, Schmid, D., Tsurutani, B.T., Delva, M., Plaschke, F., Narita, Y., Zhang, T.L., and Glassmeier, K.-H., Mirror mode waves in Venus's magnetosheath:solar minimum vs. solar maximum, Ann. Geophys., 34, 1099 – 1108, 2016, doi:10.5194/angeo-34-1099-2016