Drag effect of KOMPSAT-1 spacecraft during strong solar and geomagnetic activity

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We have examined the drag effect of the Korea Multi-Purpose Satellite-1 (KOMPSAT-1) during strong solar and geomagnetic activities. There are two major mechanisms to induce satellite drags: the heating by solar EUV radiation (characterized by F10.7), and the heating by joule heating via particle precipitation during geomagnetic storms (characterized by ap, Dst and Polar Cap index). In order to examine these effects, we select five events dominated by the radiation effect and/or the particle effect. In addition, we compared the density derived from the drag acceleration equation with that based on the MSISE-90 empirical atmospheric model. The major results can be summarized as follows. (1) The satellite drag acceleration started simultaneously with the increase of solar EUV radiation such as solar flares and then has the best correlation with the 1 day delayed F10.7. (2) We found that there were five abrupt changes of drag acceleration that were nearly coincident with geomagnetic storms. (3) While the background variation of the drag acceleration is governed by solar radiation, their short term (about a day) variation by strong geomagnetic storms. (4) The density from the MSISE-90 empirical atmospheric density model is similar to that from the drag acceleration equation during the radiation dominated period but significantly (up to a factor of 8) different during the strong geomagnetic storms.