Two Types of Gamma–Ray Flares

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Yohkoh observed strong gamma–ray emission from two flares on Nov.6, 1997 (X9.0/2B) and Aug.18, 1998 (X4.9/1B). The gamma-ray spectrum of Nov.6, 1997 flare extended to more than a few tens MeV and exhibited line features superposed on the bremsstrahlung continuum. The gamma-ray lines result from nuclear deexcitation of C^*(4.44 MeV), O^*(6.13 MeV), Ne^*(1.63 MeV), Mg^*(1.37 MeV), Si^*(1.77 MeV) and Fe^*(1.24 MeV) and neutron capture (2.22 MeV). It suggests that both electrons and ions were efficiently accelerated to high–energies during the flare. Moreover, the fluxes of nuclear lines from elements with similar FIP (first ionization potential) correlated with one another during the flare, while a ratio of low–FIP (Mg, Si, Fe) to high–FIP (C,N,O,Ne) line fluxes varied with time. On the other hand, the gamma–ray spectrum of Aug.18 flare showed the different characteristic from the previous one. The bremsstrahlung continuum is strong and the lines are weak. This indicates the possibility that electrons were preferentially accelerated, whereas ions were not efficiently energized. We here present the characteristics in two types of gamma–ray flares and discuss particle acceleration processes from the differences in gamma–ray spectra.