



# A C4 class Solar Flare on Jan 20, 2000 with Nuclear Gamma Ray Line Emission



The 20<sup>th</sup> January 2000 solar flare – studied by COMPTEL – is the weakest ever observed flare to have nuclear gamma ray emission lines. The spectrum taken from this flare with BATSE and COMPTEL on *CGRO* (figure 1) shows the tell-tale sign of a nuclear line emission excess at energies >1 MeV above the extrapolation of a continuum spectrum from lower energies. The continuum is typical for bremsstrahlung emission from high-energy solar flares and was fitted with a power-law of index  $-3.1$ . SMM saw nuclear line emission only in M- and X-class flares (see figure 2). The de-convolved COMPTEL energy spectrum shows the strongest line at 2.2 MeV (neutron capture line) and at 4.4 MeV (excited  $^{12}\text{C}$  and  $^{16}\text{O}$ -interaction lines). The presence of such nuclear lines implies the acceleration of protons and ions in the flare event to energies above several  $10^6$  eV – if the production of neutrons is confirmed even to energies above 100 MeV. This observation strengthens the hypothesis that particle acceleration takes place in flares irrespective of their size.

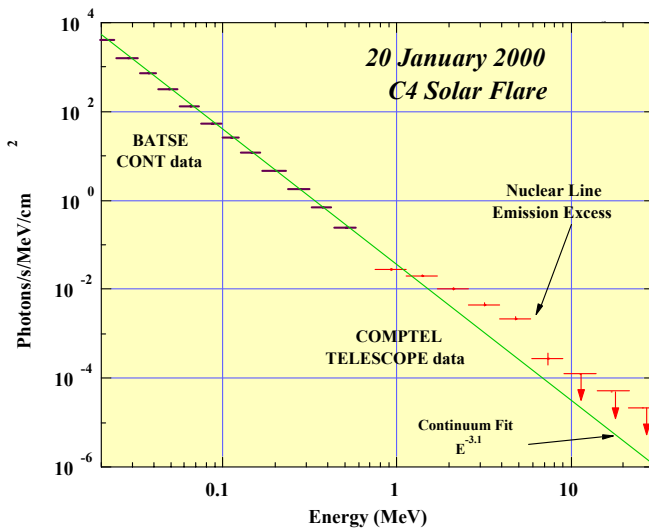


Figure 1: Gamma-ray spectrum observed from the C4 class flare on Jan 20, 2000.

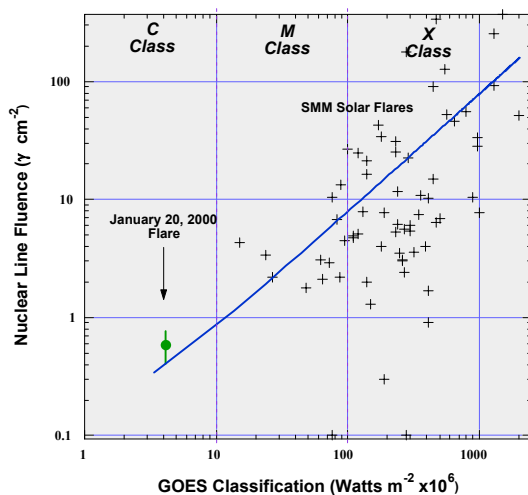


Figure 2: Nuclear line fluences observed from high-energy solar flares with SMM classified according to the GOES X-ray intensity. The new C-class flare is the weakest event observed so far displaying nuclear activity.

## Reference:

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