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The AGILE satellite detects “super-energetic” lightning that may affect aircraft navigation.

The AGILE space mission is detecting a special type of lightning that emit intense gamma-ray radiation of large intensity. This lightning phenomenon is observed to be concentrated especially in the equatorial region. AGILE is a space mission of the Italian Space Agency (ASI) with participation of the Italian Institute of Astrophysics (INAF) and the Italian Institute of Nuclear Physics (INFN). It is focused on the study of the Universe at gamma-ray energies, but it can also detect phenomena originating in the Earth atmosphere.

AGILE is indeed detecting Terrestrial Gamma-Ray Flashes (TGFs) associated with tropical thunderstorms. They typically last a few thousandths of a second, and they produce a very intense pulse of gamma-rays. AGILE joins other satellites in orbit in detecting TGFs, but its unique capability of detecting photons of the highest energies within the shortest time make AGILE an ideal istrument to study these impulsive phenomena. AGILE determined that the maximal photon energy involved in TGFs is larger than many tens of Megaelectronvolts, i.e., at least hundreds of times larger than what measured for normal lightning. Particles are accelerated by the intense TGF electric fields and copiously produce gamma-rays. The AGILE Team recently published a paper on this subject in the *Journal of Geophysical Research*.

The detection of this extreme atmospheric phenomenon led the AGILE Team to pay the highest attention to TGFs, and to evaluate together with the Italian Aviation Authority (ENAC) the possible effect on aircraft traveling near the TGF producing storms. The hypothesis of a possible effect on aircraft has been formulated in a paper recently submitted by the AGILE Team to a scientific journal. The special equatorial orbit of the satellite and its detection capability provide a unique opportunity for AGILE to gather information of interest to aircraft flying in that region.

“This super-lightning phenomenon associated to TGFs is of the greatest importance”, says Marco Tavani, Principal Investigator of the AGILE Mission. “We need to focus on these remarkable and energetic atmospheric flashes. The AGILE instrument is currently the best in orbit to detect these very rapid events lasting only a few milliseconds. We can easily determine the TGF position on Earth and rapidly communicate this information to the ground”.

“The AGILE satellite demonstrates to be a very useful mission also for Earth observations”, says Paolo Giommi, Director of the ASI Science Data Center in Frascati.
“It demonstrates that special instruments and techniques originally conceived to study cosmic events in our “violent Universe” can be effectively used to observe our planet Earth and possibly to improve aircraft safety”.