



## On the Extreme Electromagnetic Power of Lightning Superbolts Measured on Earth and in Space

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Lightning superbolts are rare and extreme events that were first identified from optical stroke data measured onboard the Vela satellites at the end of the seventies, with a power estimated between 1011 and 1013 W per stroke [1]. This study reports for the first time the electromagnetic power of lightning superbolts, with major advances on the physical characterization of these powerful natural events from high-quality measurements.

We combine space and ground-based measurements to perform to this characterization. In space, we use data from the recent NASA Van Allen Probes mission, searching superbolts in ~7 years of data. We will reveal for the first time the extreme nature of superbolts in space. On the ground we use data from a campaign we conducted in 2012-2013, which covered times and locations where a large number of superbolts occurred, as well as measurements from the VLF ground stations of the World-Wide Lightning Location Network (WWLLN) [2]. We gather major new findings about superbolts' electric and magnetic characteristics, reporting for the first time significantly different properties than common lightning flashes.

These results are important to the physics of atmospheric discharges, climate change, ionosphere-magnetosphere wave transmission, wave propagation in space, radiation belt physics, and remote sensing of extreme events. None of these results have yet been presented.

### References

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