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Properties of ubiquitous magnetic reconnection events in the lower solar atmosphere

Magnetic reconnection in the deep solar atmosphere can give rise to enhanced emission in the Balmer hydrogen lines, a phenomenon referred to as Ellerman bombs. Recent high quality Hβ observations indicate that Ellerman bombs are more common than previously thought and it was estimated that at any time about half a million Ellerman bombs are present in the quiet Sun. We performed an extensive statistical characterization of the quiet Sun Ellerman bombs (QSEBs) in these new Hβ observations from Swedish 1-m Solar Telescope. The lifetime varies between 9 s and 20.5 min. The maximum area ranges between 0.0016 and 0.2603 Mm^2. A subset (14%) of the QSEBs display enhancement of the Hβ line core. On average, the line core brightening appears 0.88 min after the onset of brightening in the wings, and the distance between these brightenings is 243 km. This gives rise to an apparent propagation speed ranging between 14.3 and +23.5 km/s, with an average that is upward propagating at +4.4 km/s. The average orientation is nearly parallel to the limbward direction. QSEBs are nearly uniformly distributed over the field of view but we find empty areas with the size of mesogranulation. QSEBs are located more frequent near the magnetic network where they are often bigger, longer lived and brighter. We conclude that QSEBs are ubiquitous in quiet Sun and appear everywhere except in areas of mesogranular size with weakest magnetic field (B_{LOS} <= 50 G). Our observations support the interpretation of reconnection along vertically extended current sheets.

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