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Lifetime and velocity distributions of small-scale magnetic fields derived from Hinode/SOT G-band filtergrams

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Abstract. The dynamics of the atmosphere of the Sun are dominated by magnetic fields. These fields span from very extended and strong fields, like sunspots, to less extended and weaker fields, like pores, down to the yet known smallest fields which are composed of single flux tubes. These small-scale magnetic fields in the solar photosphere can be identified in high-resolution magnetograms or in high resolution G-band filtergrams as magnetic bright points (MBPs). To understand the dynamics of the solar atmosphere a better understanding of the whole range of magnetic fields is necessary. In this poster contribution we will concentrate on the isolated small-scale fields (single flux tubes). Rapid motions of these fields can cause magneto-hydrodynamical waves and can also lead to nanoflares by magnetic field braiding and twisting. The MBP velocity distribution is therefore a crucial parameter for estimating the amplitudes of those waves and the amount of energy they can contribute for coronal and chromospheric heating. Based on an automatic segmentation, identification and tracking algorithm, we derived the velocity and lifetime distributions of MBPs from solar G-band images of a quiet sun region acquired by the Hinode/SOT instrument with different temporal and spatial sampling rates. The influence of temporal and spatial sampling rates on the distributions is studied, and a correction of the obtained lifetimes and velocity distributions for these digitalization effects is derived. After correction of algorithm effects, we obtained a mean MBP lifetime of (2.50 ± 0.05) min and mean MBP velocities in the range of 1 - 2 km/s (depending on smoothing processes). Corrected for temporal sampling effects, we obtained for the effective velocity distribution a Rayleigh function

with a coefficient of (1.62 ± 0.05) km/s. The x- and y- components of the velocity distributions are Gaussians. The lifetime distribution can be fitted by an exponential function.