

First stereoscopic determinations of heights and their variations of EUV bright points using SECCHI EUVI aboard STEREO

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Abstract. Three-dimensional structures of EUV bright points (hereafter BP) and their time variations are presented here for the first time. Heights of EUV BPs have been stereoscopically measured using SECCHI EUVI on board STEREO. The STEREO mission consists of the twin spacecrafts so-called ‘Ahead’ and ‘Behind’ (hereafter SC/A and SC/B) and they provide us with a pair of images observed by SC/A and B at the same time for the determining and estimating 3D geometries of coronal features. We developed a 3D reconstruction method for point-like features such as BPs. In order to analyze the heights of BPs and their morphologies, we have taken a data set consisting of 171Å, 195Å, 284Å, and 304Å images on 11 days and we have detected 386 individual BPs that were visible on all of four passband images. As a result we found that the average heights of BPs on the 171Å, 195Å, and 284Å images are 5.0 ± 2.2 , 6.7 ± 2.1 , and 6.2 ± 2.2 Mm and they are semi-circular loops whose the average heights are half of the average lengths. Moreover, we found a tendency that overlying loops are filled with hotter plasmas. On the other hand, BPs on 304Å images have the average height 4.1 ± 1.8 Mm and they are associated with the legs of the loops. In addition, we have taken 3 EUV BPs on images at 195Å observed from 21 Mar 2008 to 22 Mar 2008. We traced the BPs individually and measured heights, intensities and lifetimes. The BPs are small dynamic loop system with an average height of about 8 Mm and an average lifetime of about 20 hrs. The BPs are first appeared at 12 Mm, 9 Mm, and 8 Mm, and disappeared at similar heights, 6~7 Mm. There is a tendency that the height of a BP is the highest at the formation phase and it is reduced with its temporal evolution while the intensity of a BP is the strongest in the latter half of its lifetime. We found out that the higher BP has longer lifetime and strong intensity. The temperature structures, semi-circular loop shapes, and their downward motions are consistent with the magnetic reconnection origin of EUV BPs.