Long-Term Datasets for the Understanding of Solar and Stellar Magnetic Cycles
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The morphological comparison and analysis of coronal green line

Xuefei Zhang[1,2], Yu Liu[1] and Mingyu Zhao[1]

[1]Yunnan Observatories, Chinese Academy of Sciences, Kunming 650011, China
email: zhangxuefei@ynao.ac.cn
[2]University of Chinese Academy of Sciences, Beijing 100049, China

Abstract. The coronal is the origins of large-scale solar activity and disastrous space weather, it contains extremely rich information and various physical processes. The coronal loop is a kind of bright structure with hot plasma which is bounded by magnetic field in the coronal, it is a good reflection of the magnetic structure that we can hardly observe directly. It is also the energy channel between the photosphere and coronal, and the study of coronal loop is helpful for us to understand the magnetic line foot movement.

Keywords. Corona, Coronagraph, Magnetic fields, Coronal loop.

1. Background and current situation

The coronagraph is designed to let the coronal beam enters the imaging system, by blocking the photosphere through artificial solar eclipse. This professional astronomy equipment can be used to observe the structure and spectrum of the coronal.

The Lijiang coronalgraph consists of a 10 cm objective lens, a tunable Lyot filter and a cooling CCD camera (Ichimoto *et al.* 1999).The green line imaging terminal is a set of efficient imaging systems working on the coronal green line (Fe XIV 530.3 nm),.The system is called YOGIS (Yunan Observatory Green-line Imaging System). Lyot filter transmission curve can be tuned by two liquid crystal variable retarder modulation. This scheme provides quick wavelength tuning and efficient subtraction of sky background. The coronal green line intensity and doppler velocity distribution can be obtained within 30 seconds. The spatial resolution is 2.75 arcseconds, and the measuring range is 1.03 - 1.5 solar radius(Badalyan *et al.* 2001, Sakurai 1998, Sakurai 2004, Sakurai & Suematsu 2002). The mult-iband observation range of SDO is from 0.06 MK to 20 MK. Help us understand how the sun activity mechanism and how solar energy is stored and how it is released into the photosphere and Earth space(Pesnell *et al.* 2012).

The temperature and density properties of the coronal loops differ at different temperatures, for example, the temperatures at different locations on the warm loops are approximately the same, while the hot loops are different(Brekke *et al.* 1997). The differences with temperature and density of corona loops indicate that it may arise from different physical mechanisms(Huang *et al.* 2012).The study on the geometrical morphology of coronal loops can provide important reference significance when we are exploring the corona magnetic field structure and magnetic reconnection. In general, the loops have symmetric structure, and the cross section of the loops have a small change along the ring. Therefore, the real morphological of the loops must also be considered (Aschwanden *et al.* 2008, Golub *et al.* 1990).

We can use the Lijiang coronagraph (green line) and space observation data, to analysis the structure and morphology for corona loops with different temperature. At the same

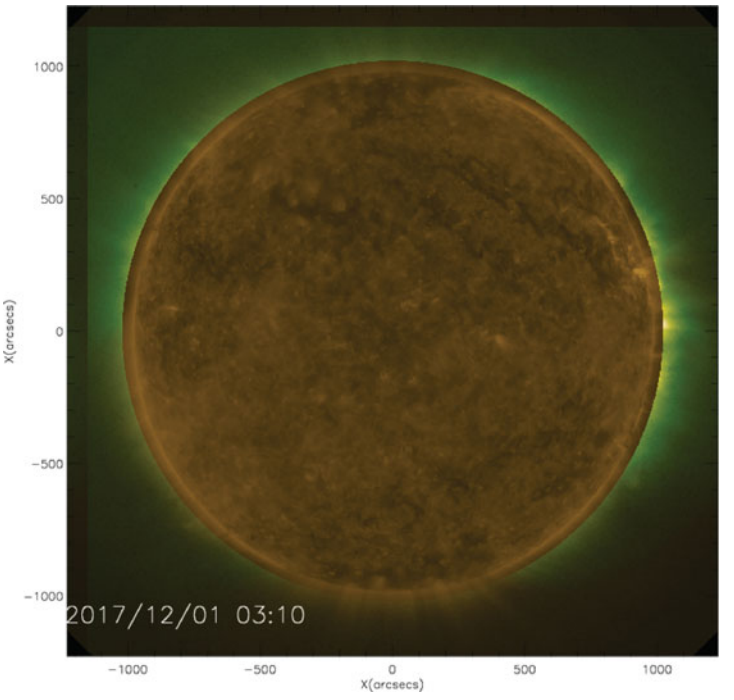

Figure 1. A composite coronal image including solar full disk (AIA/SDO,17.1nm), inner corona (Lijiang coronagraph, 530.3 nm).

time, combining the observations of SDO with our coronagraph data, it is convenient for us to comparison and analysis the coronal loops. At the same time, it also revealed the structure of the solar field that we can hardly observe directly in normal time(Rosner *et al.* 1978).In China NSFC (11533009, 11503084) has been supported aiming to find excellent sites to build large coronagraphs(Liu *et al.* 2016).

References

Ichimoto, K., Noguchi, M., & Tanaka, N., *et al.* 1999, *PASJ*, 51, 383
Badalyan, O., Obridko, V., & Sykora, J. 2001, *Sol. Phys.*, 199, 421
Sakurai, T. 1998, *ASPC Seri.*, 140, 483
Sakurai, T. 2004, *Adv. Space Research*, 34, 297
Sakurai, T., & Suematsu, Y. 2002, *Adv. Space Research*, 29, 1565
Pesnell, W. D., Thompson, B. T., & Chamberlin, P. C. 2012, *Solar Physics*, 275, 3
Brekke P, Kjeldseth-Moe O, Harrison R A. 1997, *Solar Physics*, 175, 511
Huang Z, Frazin R A, Landi E, *et al.* 2012, *ApJ*, 755, 86
Aschwanden M J, Nitta N V, Wulser J P. 2008, *ApJ*, 680, 1477
Golub L, Nystrom G, Herant M, *et al.* 1990, *Nature*, 344, 842
Rosner R, Tucker W H, Vaiana G S. 1978, *ApJ*, 220, 643
Liu, Y., Song, T., & Zhang, X., *et al.* 2016, *IAU Symp.*, 320, 447

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