

# 太 阳 光 谱 望 远 镜 和 Stokes 光 谱 测 量

屈中权 张霄宇 陈学昆 冯永明 顾啸马 钟树华

(中国科学院国家天文台 北京 100012)

(中国科学院云南天文台 昆明 650011)

## 摘 要

中国科学院云南天文台“太阳 Stokes 光谱观测与理论研究”团组自进入国家天文观测中心以来,经过一年多的努力,对 50cm 太阳光谱望远镜原偏振测量部分进行了彻底改造,由原来的 D.C. 调制改为 A.C. 调制,且增加了偏振测量校正系统。其机械,电控设计和加工于 2000 年 2 月完成,3 月完成了光学调试,4 月上旬完成了偏振解调和图像处理的软件编制。自 2000 年 4 月下旬以来,对 23 周峰年出现的部分活动区进行了较为成功的斯托克斯光谱测量,其偏振测量精度可达  $2 \times 10^{-3}$ ,已接近国际水平,为该团组开展的课题研究打下了良好的基础。以此望远镜与怀柔观测基地太阳磁场望远镜相配合,将使我国太阳矢量磁场和速度场的研究更上一个台阶。给出了偏振测量的具体方法和部分测量结果。

尽管取得了以上的成绩,但在近期内将对偏振测量方式作进一步改进,用双光束分析代替单光束分析,使偏振测量精度提高到  $5 \times 10^{-4}$ ,从而使之不仅能在活动区而且也能在宁静区得到矢量磁场的信息,不仅如此,还可对太阳第二光谱进行测量,提高我们依托该望远镜进行研究的广度和深度。

关键词 仪器 — 太阳光谱望远镜 — Stokes 参数

分类号 P182.3

## Solar Spectroscopy Telescope and the Stokes Spectrometry

Qu Zhongquan Zhang Xiaoyu Chen Xuekun Feng Yongming Gu Xiaoma Zhong Shuhua

(National Astronomical Observatories, Chinese Academy of Sciences, Beijing 100012)

(Yunnan Astronomical Observatory, Chinese Academy of Sciences, Kunming 650011)

## Abstract

Since the join of the group “Solar Stokes spectrometry and theoretical research” in Yunnan Astronomical Observatory, CAS, into national astronomical observatories, we have made a thorough improvement for the existed polarization package in the 50 cm solar spectroscopy telescope during the past year. The modulation mode has been changed from D.C. to A.C., and a calibration system for polarization measurement was added. The design and processing of both mechanical

and electronic-controlling systems for the polarization measurement were accomplished in Feb. 2000. Optical calibration was finished in March, 2000. Software programming for the polarization de-modulation and image processing were completed early in April, 2000. Since late April, 2000, we have undergone successful Stokes spectrometry to some active regions during solar cycle 23. The accuracy of the polarization measurement can be up to  $2 \times 10^{-3}$ , well approaching to the world level. This has laid a good foundation for the future scientific research. The combination of this facility with solar magnetic telescope in Huairuo Solar Observing Station will step up nation's level in the solar vector magnetic and velocity field investigation. The detailed method of polarization measurement and some of our recent observational results are given also.

Further improvement of the method of polarization measurement by substituting single beam analysis with double beam will be carried out. The accuracy is expected to be  $5 \times 10^{-4}$ , thus making it possible to acquire the magnetic field information not only from activity regions but also from quiet areas. Furthermore, it will be feasible to measure the second solar spectrum, leading to a much more wide usage of this telescope.

**Key words** instrument—solar spectroscopy telescope—Stokes parameters