ORIGINAL ARTICLE

The revision of the turbulence profiles restoration from MASS scintillation indices

Victor G. Kornilov · Matwey V. Kornilov

Abstract The altitude distribution of optical turbulence is derived from the MASS instrument data by solving an inverse problem. In this paper, some modifications of the profile restoration are described. The principal change is the introduction of the Non Negative Least Squares algorithm which has good regularizing properties. An averaging of scintillation indices was replaced with averaging of obtained solutions what leads to clearer physical results. It is shown that restoration with a number of turbulent layers as large as 14–15 can be successfully performed.

Keywords Optical turbulence · Stellar scintillation · Data processing · NNLS

1 Introduction

It is well known that the efficiency of astronomical observations in optical and near IR range greatly depends on turbulence in the earth's atmosphere. Modern techniques for telescope efficiency gain require both statistically-valid long-term and near real-time information about properties of the optical turbulence (OT) above an observatory. In general, the turbulence intensity is described with help of the refraction index structure constant C_n^2. One of the instruments designed to measure this parameter is MASS (Multi Aperture

V. G. Kornilov (✉) · M. V. Kornilov
Sternberg Astronomical Institute, Universitetsky prosp. 13, 119992,
Moscow, Russia
e-mail: victor@sai.msu.ru

M. V. Kornilov
e-mail: matwey@sai.msu.ru