地球科学进展 2009, 24(7) 724-733 DOI: ISSN: 1001-8166 CN: 62-1091/P

能水平衡观测与模拟

黑河流域观测通量的空间代表性研究

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摘要：

地表湍流通量包括显热通量和潜热通量，它的准确测定对天气气候预报、农业节水和水资源管理等意义重大。目前应用较为广泛的通量测量技术有涡动相关仪(EC)和大孔径闪烁仪(LAS)，前者是单点观测，观测范围通常只有几百米;后者近年来得到长足的发展，可以观测从几百米到十几公里尺度上的区域湍流通量。建立了EC和LAS通量解析足迹模型，详细介绍了足迹模型的理论依据和建立方法，并对二者模型的异同进行了阐释。在黑河流域遥感—地面观测同步试验中，以高寒与干旱区伴生的黑河流域为试验区，包括寒区水文试验、森林水文试验和干旱区水文试验，使用足迹模型分别分析了临泽草地站、阿柔冻融观测站的EC、LAS观测通量的源区，结合风向变化规律，对二者通量观测差异进行分析解释;分析了盈科灌区绿洲站、大野口关滩森林站的EC观测数据，以及阿柔冻融观测站的EC、LAS观测数据，选择具有代表性的月份，进行观测站点的空间代表性分析。结果表明：对通量观测站点进行空间代表性分析是十分必要的，可得到观测站点通量源区的时空变化特征，同时足迹模型在通量观测数据的分析中有很大的实用价值，可为今后通量观测数据的应用提供参考。

关键词： 黑河流域;大孔径闪烁仪;涡动相关仪;解析足迹模型;空间代表性

Investigation of Spatial Representativeness for Surface Flux Measurements in the Heihe River Basin

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Abstract:

It is very important to determine the land surface fluxes, including sensible heat fluxes and latent heat fluxes, for the issues involving many aspects of climate, agriculture, and water resources management. Nowadays, the Eddy Covariance system (EC) and the Large Aperture Scintillometer (LAS) are the main instruments measuring surface fluxes. The former is point observation and can observe hundreds of meters and the latter can observe area average fluxes in the scale of hundreds of meters to ten kilometers. In order to analyze the source area, we develop Eulerian analytical footprint models for the EC and LAS. Detailed descriptions of the theory basis and methods of the two models are given, and their differences are discussed. Simultaneous remote sensing and ground based experiment was being carried out in the Heihe River Basin, its observing major components of water cycle were in three experiment areas, i.e ., cold region, forest, and arid region hydrology experiment areas. This paper shows some outcomes of the flux footprint models application in A′Rou freeze/thaw observation station, Yingke irrigated oasis station, Dayekou Guantan forest station and Linze grassland station. The representatinve one day or one month is selected. The analysis of the source area and spatial representativeness of the EC and LAS is given. The difference of observing flux is discussed. In the end，it reveals that reasonable source area of LAS and EC can be derived from their flux footprint models and the footprint model is an effective and practical tool.

Keywords: Heihe River Basin Large aperture scintillometer Eddy covariance system Analytical footprint models Spatial representativeness.

收稿日期 2009-03-13 修回日期 网络版发布日期 2009-07-10

DOI:

基金项目:

国家重点基础研究发展计划项目“陆表生态环境要素主被动遥感协同反演理论与方法”（编号：2007CB714401）;公益性行业(气象)科研专项“大尺度水热通量观测系统的研制与应用研究”（编号：GYHY200706046）;中国科学院西部行动计划（二期）项目“黑河流域遥感—地面观测同步试验与综合模拟平台建设”（编号：KZCX2 XB2 09）资助.

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