The land surface variables products validation using the wireless sensor network observations considering the multi-scale spatio-temporal heterogeneity

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ABSTRACT
A wireless sensor network system was established in Huailai Remote Sensing Test Station (HRSTS). The soil temperature and moisture, LAI, air temperature et al. can be measured continuously on twenty points spread in 2*2 kilometer considering the multi-scale spatio-temporal heterogeneity. One set LAS, lysimeter and two set Eddy covariance system was established at the same site. The land surface variables products would be validated using this wireless sensor network observations.

INTRODUCTION
The accuracy of remote sensing products is critical for climate models and weather forecast applications, as it can help to characterize uncertainty and forecast error. However, the accuracy of remote sensing products is not consistent due to differences between retrieval algorithms and data sources. Thus, evaluation of satellite-derived products is an essential precursor to scientific research and subsequent environment monitoring. It is difficult to compare ground measurements to satellite pixels, especially over heterogeneous land surface.

OBJECTIVE
The Huailai test station, is located in the semi-arid region of northern China (Hebei Province). It is one of the stations in China used for quantitative remote sensing product validation. A 2 km*2 km area from 115.778° E-115.799° E and 40.348° N-40.361° N was selected as the remote sensing albedo product validation region. The main objective is to provide a coarse pixel scale ground “truth” over heterogeneous land surface and then assess the remote sensing products.

METHODS
The WSN nodes are distributed in an optimal layout that is determined using a sequential selection method based on the representativeness of the sensors. The WSN dataset in this study covers 6 nodes. An upscaling function with different weights for each node, which are calculated with the ordinary least squares (OLS) linear regression method, is used to upscale WSN node observation to a coarse pixel scale. Pixel scale ground “truth” are also evaluated.

RESULTS
The sampling strategy were capable of capturing the same spatial variance as the satellite pixels during different landcovers. Ground “truth” at pixel scale that was upsampled from measurements at multiple nodes possesses high precision.

DISCUSSION
Whether on homogenous vegetation-covered surfaces or heterogeneous mixed coverage surfaces, the ground “truth” at pixel scale evidently captures enough of the same variability as the 1 km satellite pixels both spatially and temporally.

CONCLUSION
This paper describes a new approach that uses WSN observations to provide the coarse pixel scale ground “truth” over heterogeneous land surfaces, including an optimal sampling design to fit coarse-scale pixel and a method for upscaling multi-node measurements to coarse-scale pixels.

REFERENCE