GF-1 WFV surface reflectance quality evaluation in countries along "the Belt and Road"

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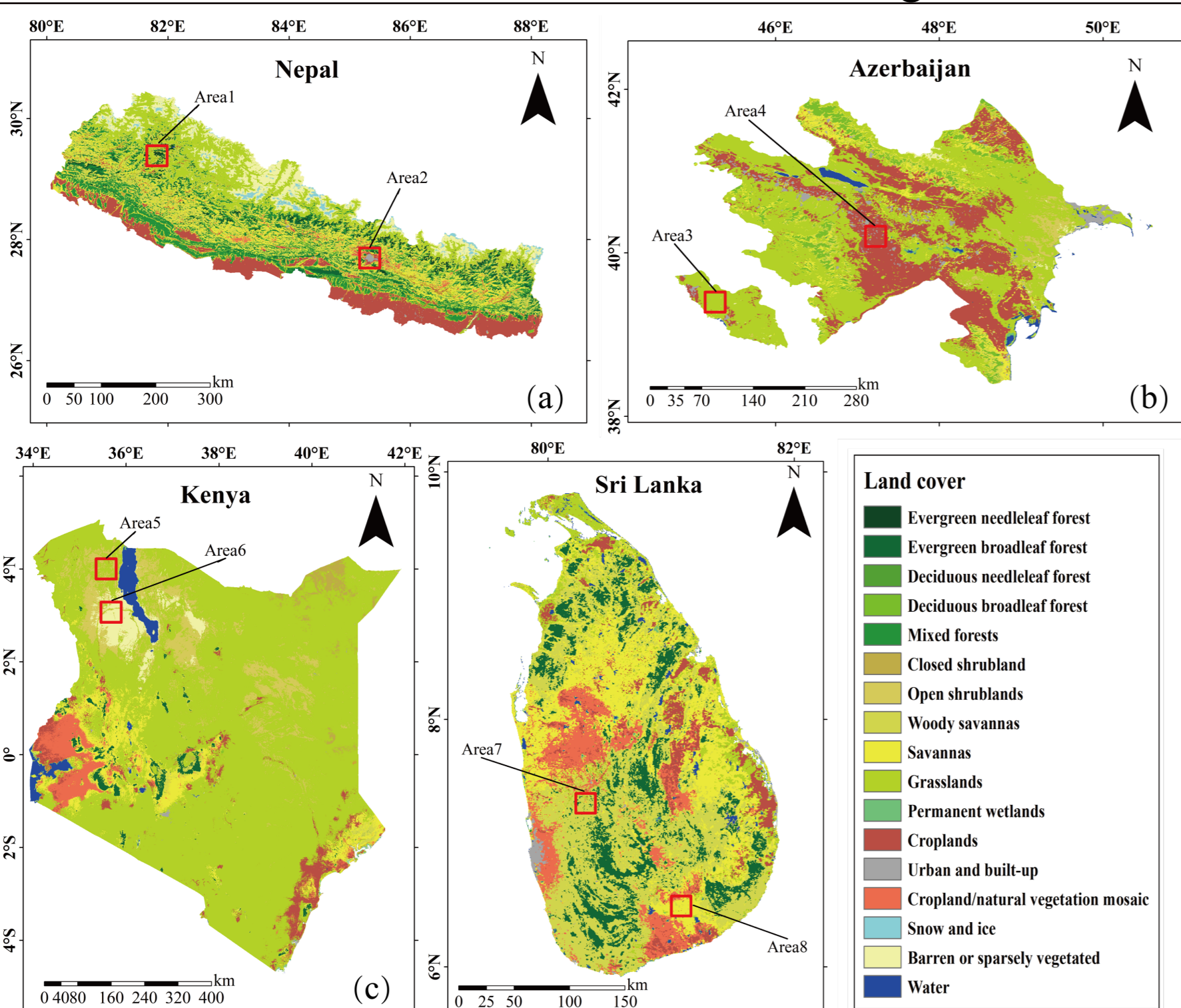
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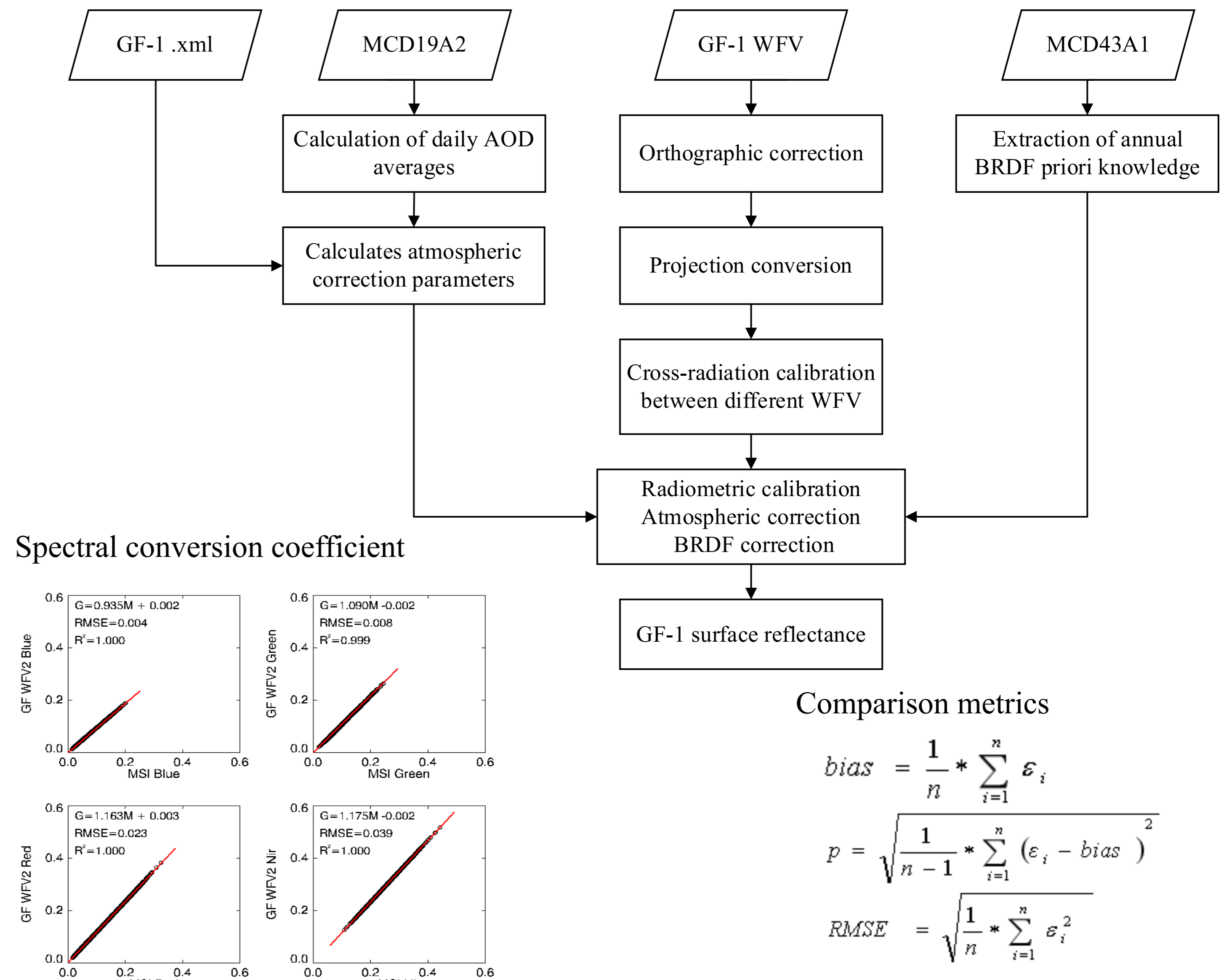
Abstract:

GaoFen-1 wide field of view (GF-1 WFV) has produced Level 1 DN data globally, but most applications focus on China and the data quality outside China has not been validated. Here we propose a process to obtain GF-1 WFV surface reflectance. The 2020 Gaofen surface reflectance of Nepal, Azerbaijan, Kenya and Sri Lanka is evaluated using MODIS, Landsat-8 OLI, Sentinel-2 MSI data. The results provide a preliminary assessment of GF-1 WFV surface reflectance in in countries along "the Belt and Road".
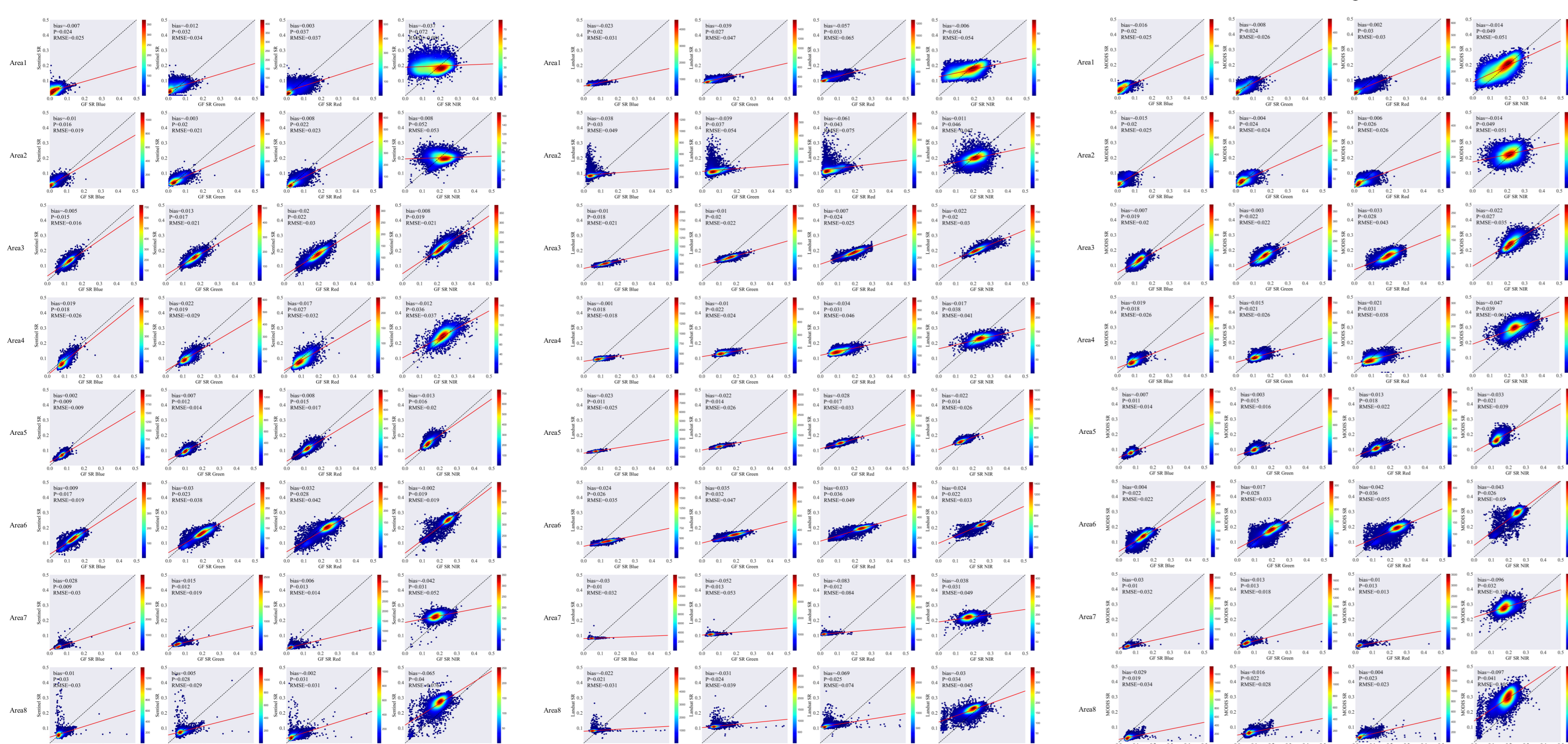
Study area

Area	Country	Surface type
Area1	Nepal	grassland with some mixed evergreen forest
Area2	Nepal	impermeable surface and forested grassland
Area3	Azerbaijan	grassland
Area4	Azerbaijan	agricultural land
Area5	Kenya	dominated by sparse shrubs with some grassland
Area6	Kenya	bare ground with essentially no vegetation cover
Area7	Sri Lanka	forested grassland
Area8	Sri Lanka	mixed savanna and agricultural land

Methods

Spectral conversion coefficient

Comparison metrics

$$bias = \frac{1}{n} * \sum_{i=1}^{n} \varepsilon_i$$

$$p = \sqrt{\frac{1}{n-1} * \sum_{i=1}^{n} \left(\varepsilon_i - bias\right)^2}$$

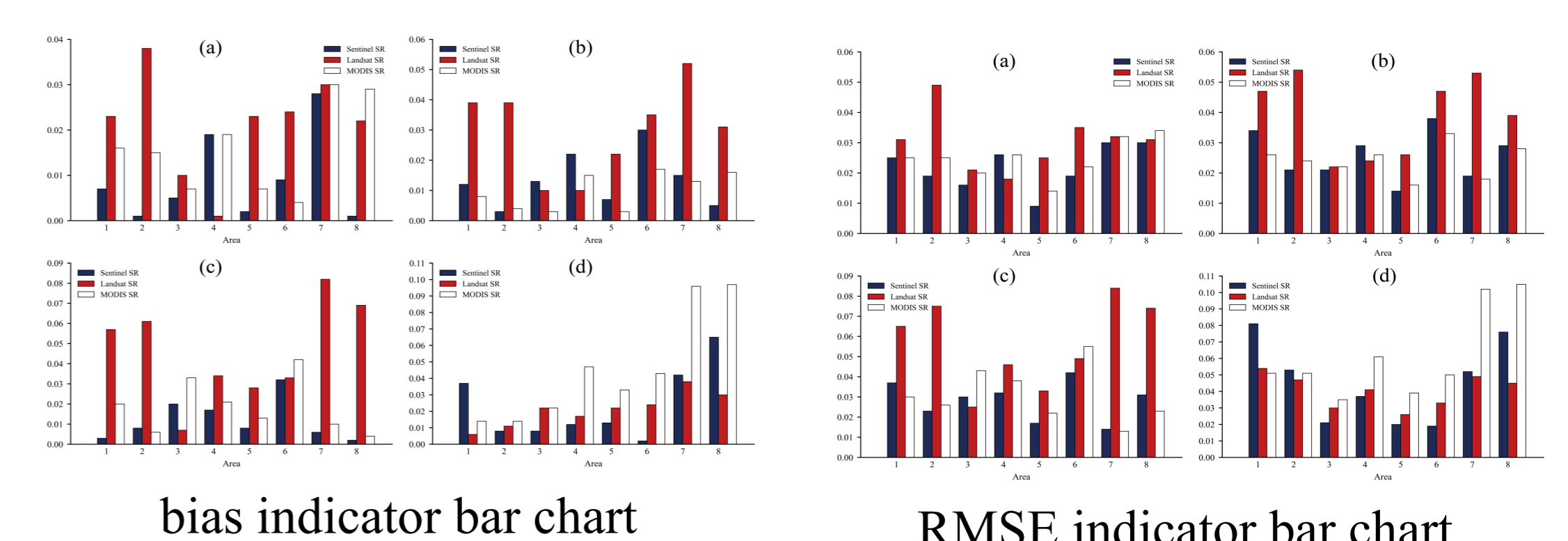$$RMSE = \sqrt{\frac{1}{n} * \sum_{i=1}^{n} \varepsilon_i^2}$$

Preliminary Results

Before plotting the scatter plots, the spectral conversion for Sentinel Landsat, MODIS SR was performed based on the spectral conversion coefficients of the sensors and then the statistical indicators were calculated.

Bar charts (a), (b), (c), (d) represent the blue, green, red and NIR bands.

Scatter plot of GF SR and Sentinel SR

Scatter plot of GF SR and Landsat SR

Scatter plot of GF SR and MODIS SR

P indicator bar chart

bias indicator bar chart

RMSE indicator bar chart

Conclusion

The NIR bands of Sentinel SR and GF SR are slightly different when the surface type is forest; there are no significant differences in the VIS-NIR bands for the other surface types;

Green and red bands of Landsat SR and GF SR are different when the surface type is forest; there are no significant differences in the VIS-NIR bands for the other surface types;

No significant differences in the visible band between MODIS SR and GF SR; increased differences in the NIR band, with larger differences when the surface type is forest;