Spatial and temporal distributions of CO2 concentration and its influencing factors in Central Asia

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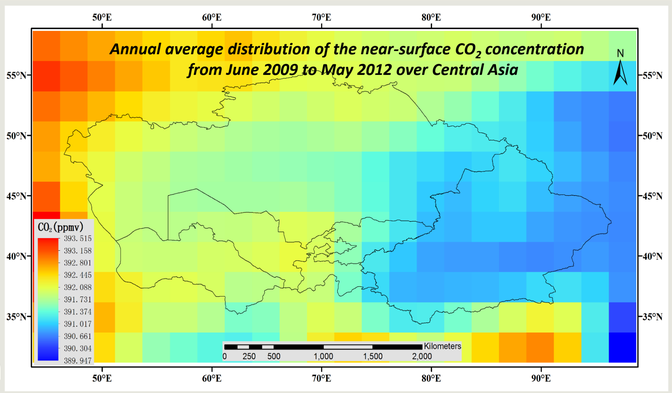
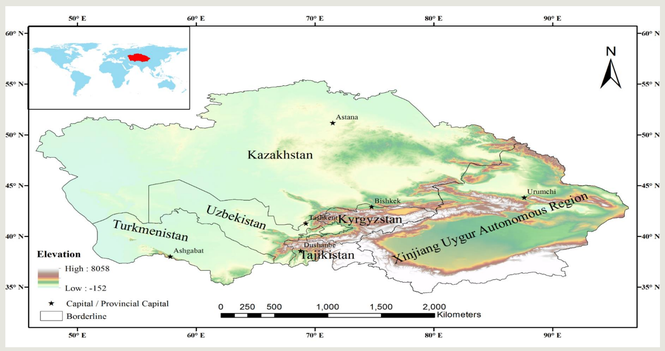
1. INTRODUCTION



As a greenhouse gas which is most seriously affected by human being, Carbon dioxide (CO_2) plays the most important role in global climate change compared to other greenhouse gases in atmosphere.

As the largest inland arid region in the world, Central Asia is not affected by carbon sink of ocean. At the same time, the prevailing winds in this area are very stable. These factors significantly reduce the complexity of analysis. As the core area of Silk Road Economic Belt, it is useful monitoring the spatial and temporal pattern of CO_2 for low carbon construction along the road. At last, in view of vulnerable ecosystem in Central Asia, it is necessary to study the spatial and temporal distrubution of CO_2 in this area.

2. STUDY AREA



The study area is located in central Asia, including Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan and Xinjiang Uygur Autonomous Region of China.

The area of study area is nearly 5,638 x 10^6 km^2 , accounting for a third of the global arid area.

3. MATERIALS AND METHODS

Materials

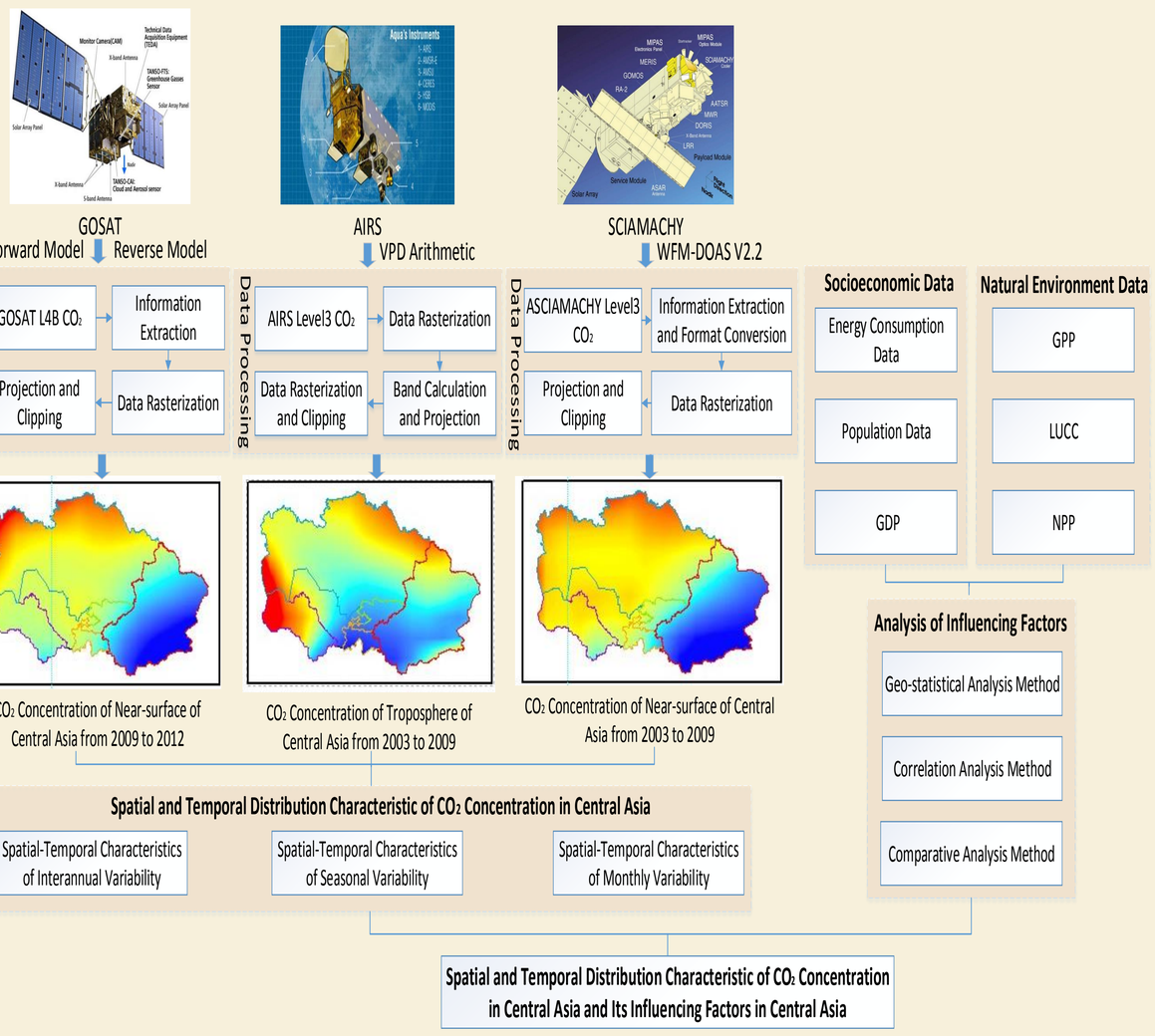
Remote Sensing Data
- ♦GOSAT L4B CO2
- ♦AIRS Level3 CO2
- ♦SCIAMACHY Level3 CO2

Socioeconomic Data
- ♦Energy Consumption Data
- ♦Population Data
- ♦GDP

Natural Environment Data
- ♦GPP
- ♦NPP
- ♦LUCC

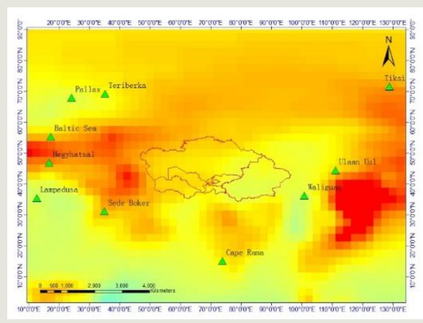
Methods

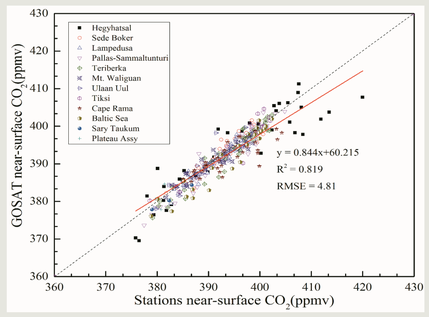
Geo-statistical Analysis
Correlation Analysis
Comparative Analysis



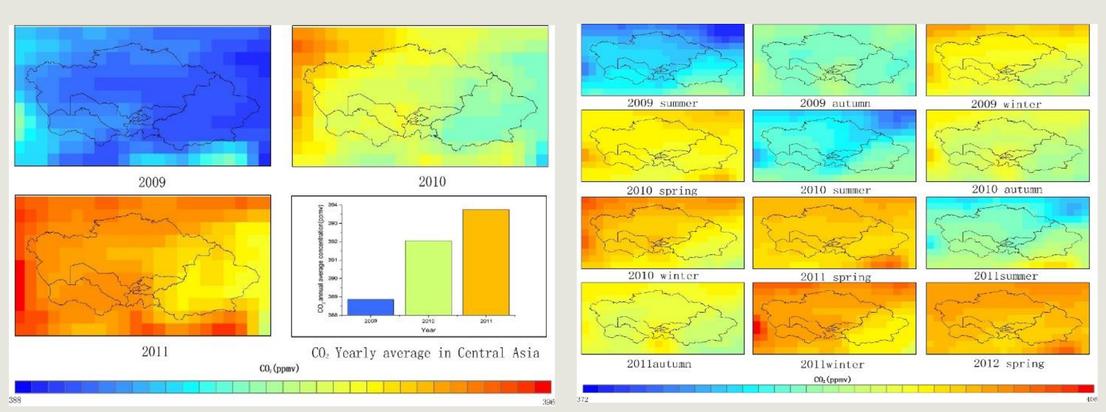
4. RESULTS AND DISCUSSION

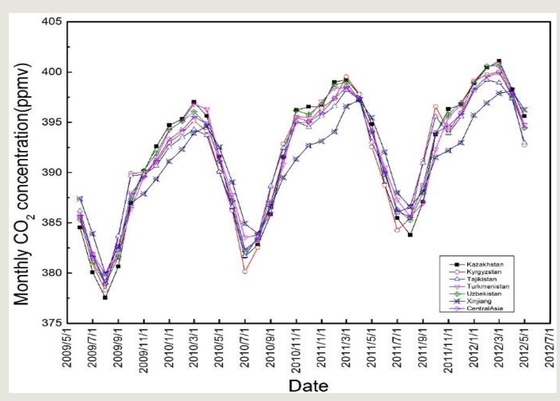
Accuracy verification of remote sensing data



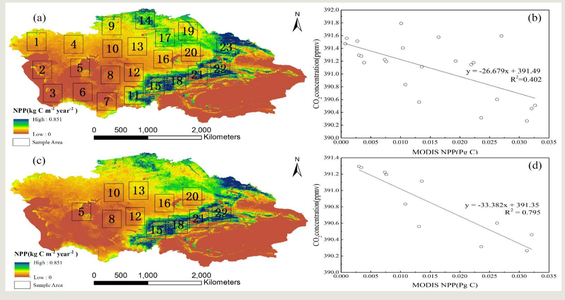


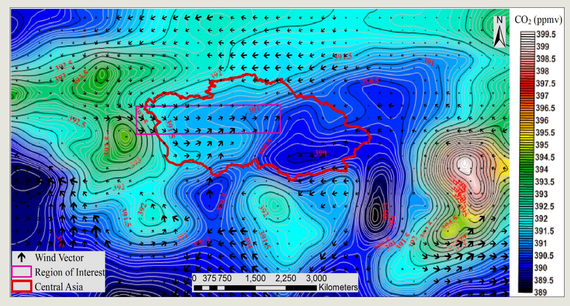
Spatial and temporal distribution characteristic of CO_2 concentration

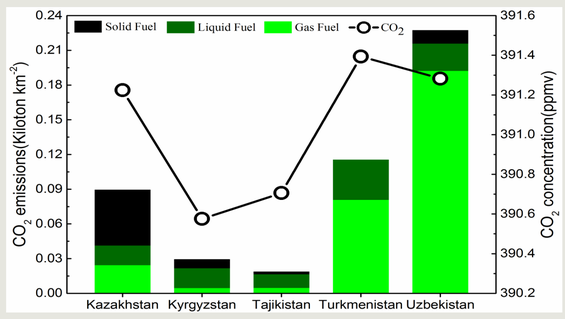


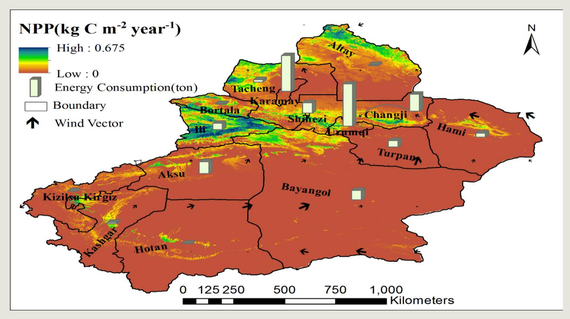


Influencing factors analysis









♦All correlation coefficents (R) are higher than 0.8 and monthly deviations between satellite and situ stations are less than 3 ppmv. The accuracy of GOSAT data is enough for analyzing spatial and temporal distributions of CO_2 concentration and its influencing factors.

♦Near-surface CO_2 concentration Central Asia is significantly higher in East Central Asia and lower in West Central Asia.

♦The CO_2 concentration has been increasing year by year from June 2009 to May 2012. Near-surface CO_2 concentration in Central Asia has a significant seasonal variation.

♦The temporal variation of near-surface CO_2 concentration is mainly affected by heating , photosynthesis and respiration of terrestrial ecosystem. The decisive factor varies by season seasons.

5. ACKNOWLEDGEMENTS

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