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Design and construction of the flux observation system in Chongqing karst regions

Ma Mingguo 18723206117 mmg@swu.edu.cn

School of Geographical Sciences, Southwest University

Outlines

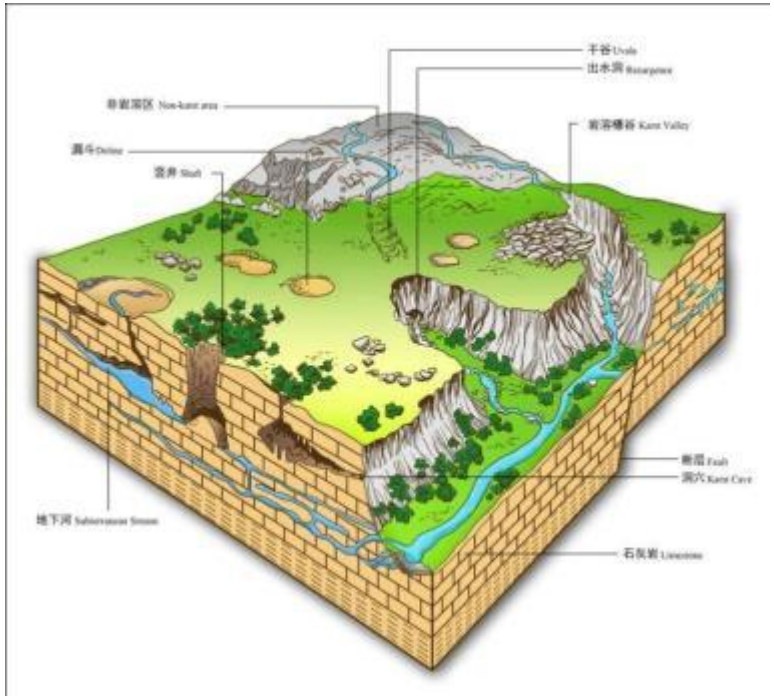
1. Introduction

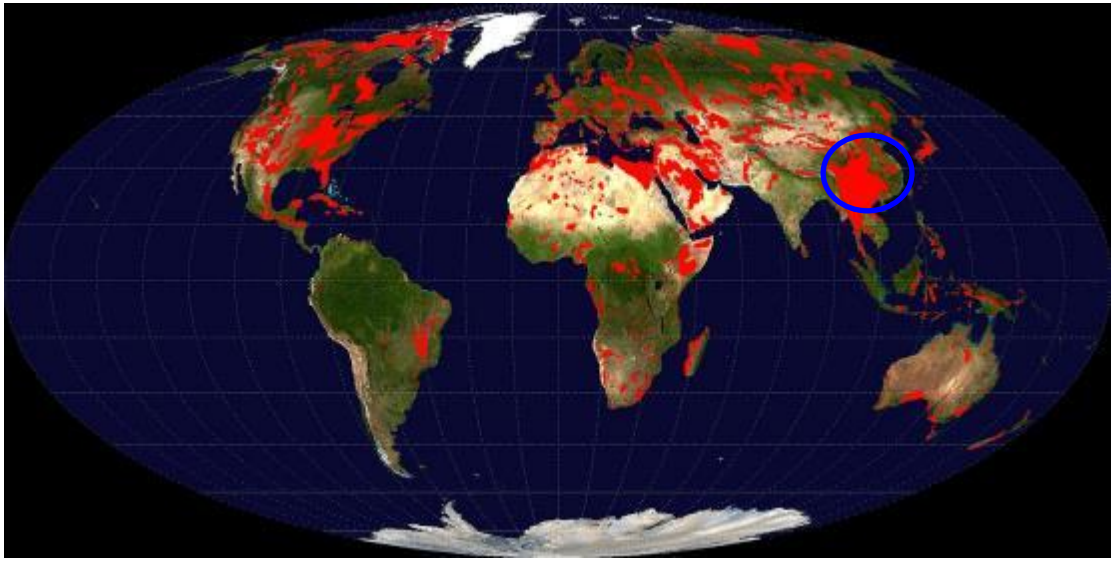
2. Being constructed EC towers in Chongqing karst regions

4. Conclusions

1. Introduction

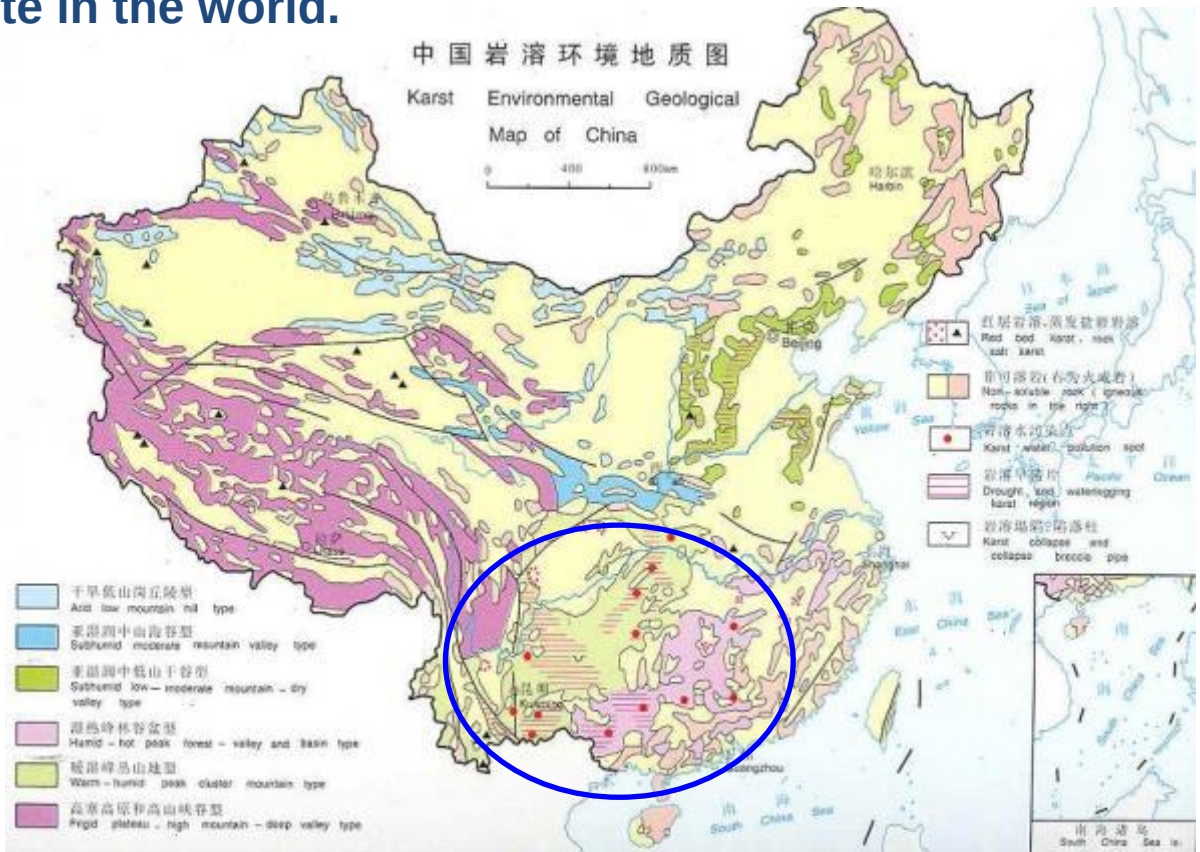
Karst is a distinctive topography in which the landscape is largely shaped by the dissolving action of water on carbonate bedrock (usually limestone, dolomite, or marble). The karst distribution area in the world is about 1.8×10^7 km^2, occupying occupy about 1/7 of the world's land. The karst distributed is in 40 countries in the world, and almost 1/6 of world population.





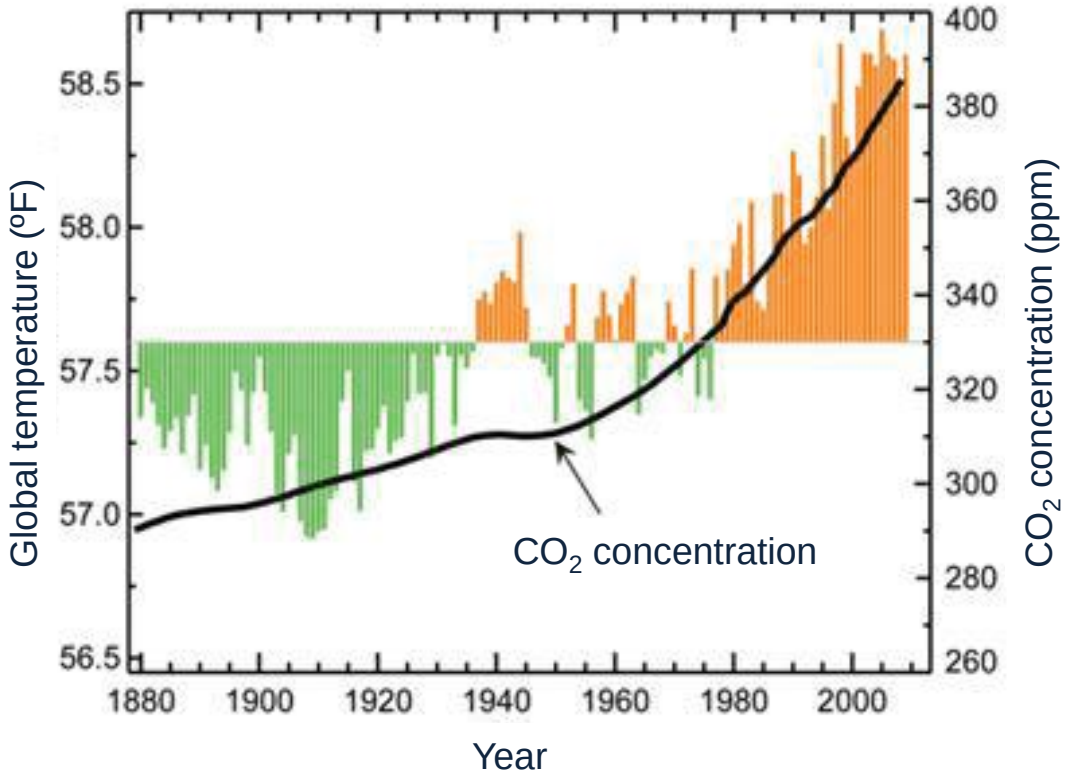
1. Introduction

China is most widely distributed country with karst areas in the word. The karst distribution area in China is up to 3,440,000 km^2, occupying 1/3 of national territorial area. Furthermore, the karst distribution area reaches 500,000 km^2 in south of China, which is the largest contiguous exposed area of carbonatite in the world.



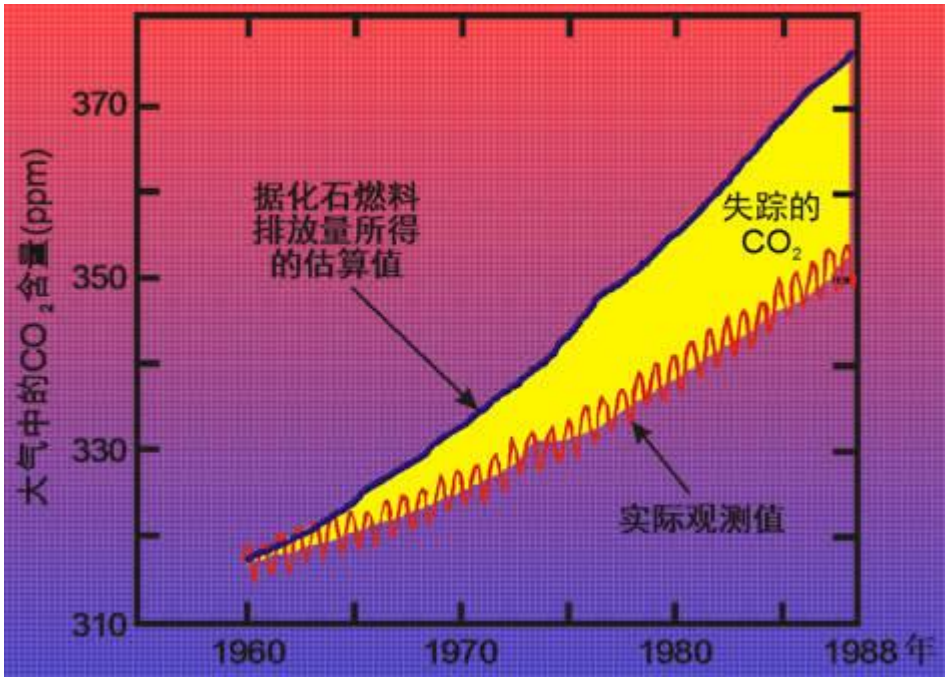
1. Introduction

Because of the important effects of the atmospheric CO_2 concentration on the global environmental changes, the carbon cycle problems has attracted more and more attentions in the world and has become one of the key scientific issues in the global change studies.



1. Introduction

‘Missing sink’ is an important scientific problem of the imbalances in the global carbon budget and the amount is about 2.8PgC/a. At present, the causation analysis mainly focus on the sea, vegetation and soil, atmosphere。



Melnikov et al., GRL, 2006
doi:10.1029/2005GL023935

1. Introduction

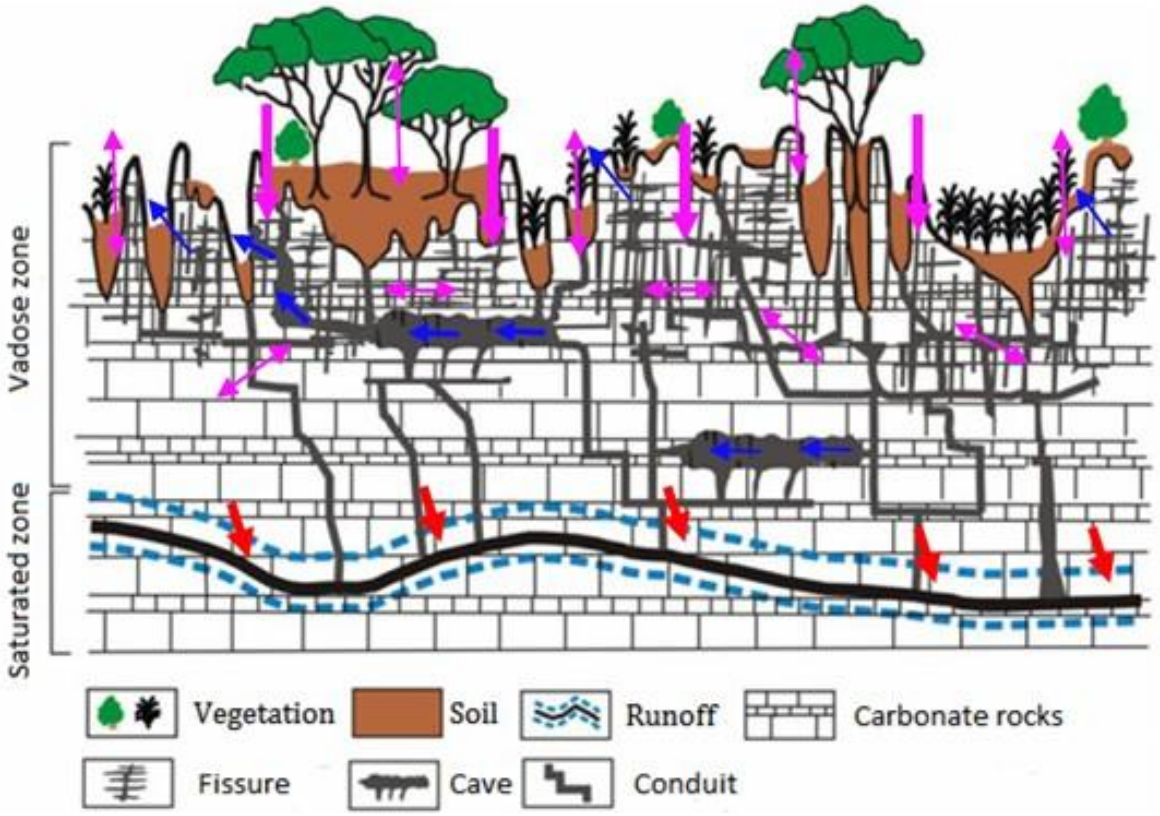
At global scale, 6.1×10^{15}t is stored in the carbonate rocks, which is the biggest carbon pool and occupies 99.5% of the total global C in the modern earth.

1. Introduction

According to the preliminary estimate from IGCP379, the global karst carbon sequestration is about 0.61Pgc/a. We need more observations and researches to quantitatively correct the amount of the global karst carbon sequestration. But this work was gradually emphasized in the nearly 10-20 years.

1. Introduction

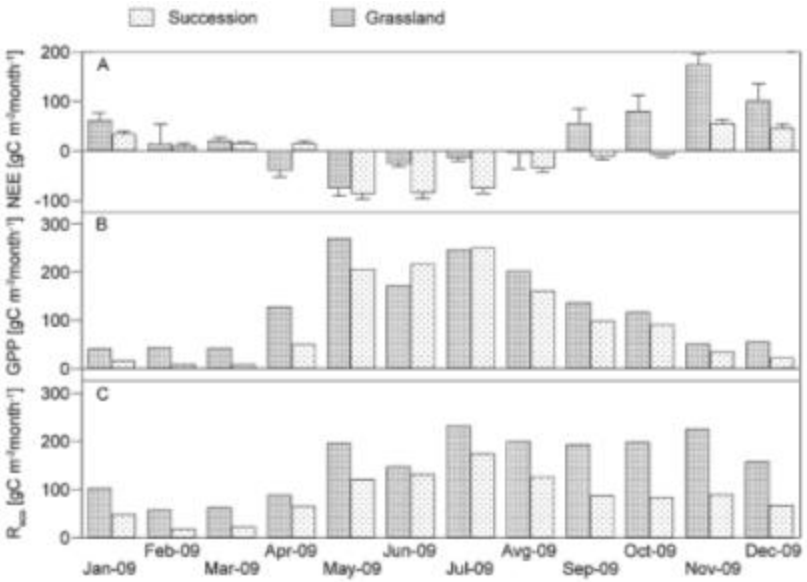
Because of many macroscopic voids, numerous fissures, and caves across the karst landscape, air passage in the vadose zone is more complicated than in many other landscapes, and surface CO_2 emissions can be extremely variable。

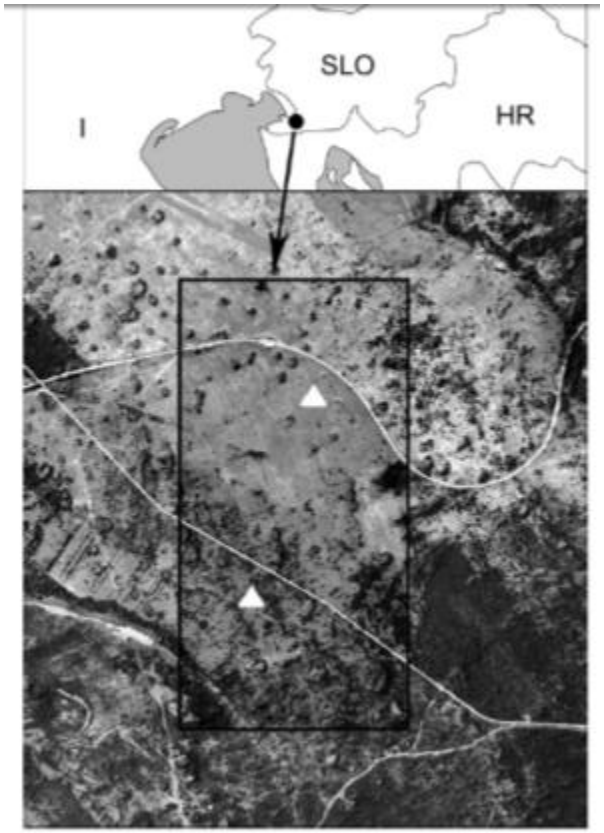


Yan, JGR-Biogeosciences , 2012
doi:10.1029/2012JG002060

1. Introduction

To date, there are relatively few observations of the carbon flux in karst regions. As a case study in Slovenia, carbon flux was measured in the grassland and subsequent secondary succession. According to one year of data succession site stored -126 ± 14 $gCm^{-2}\,y^{-1}$ while grassland site emitted 353 ± 72 $gCm^{-2}\,y^{-1}$.





Ferlan et al., AFM, 2011
doi:10.1016/j.agee.2010.12.00

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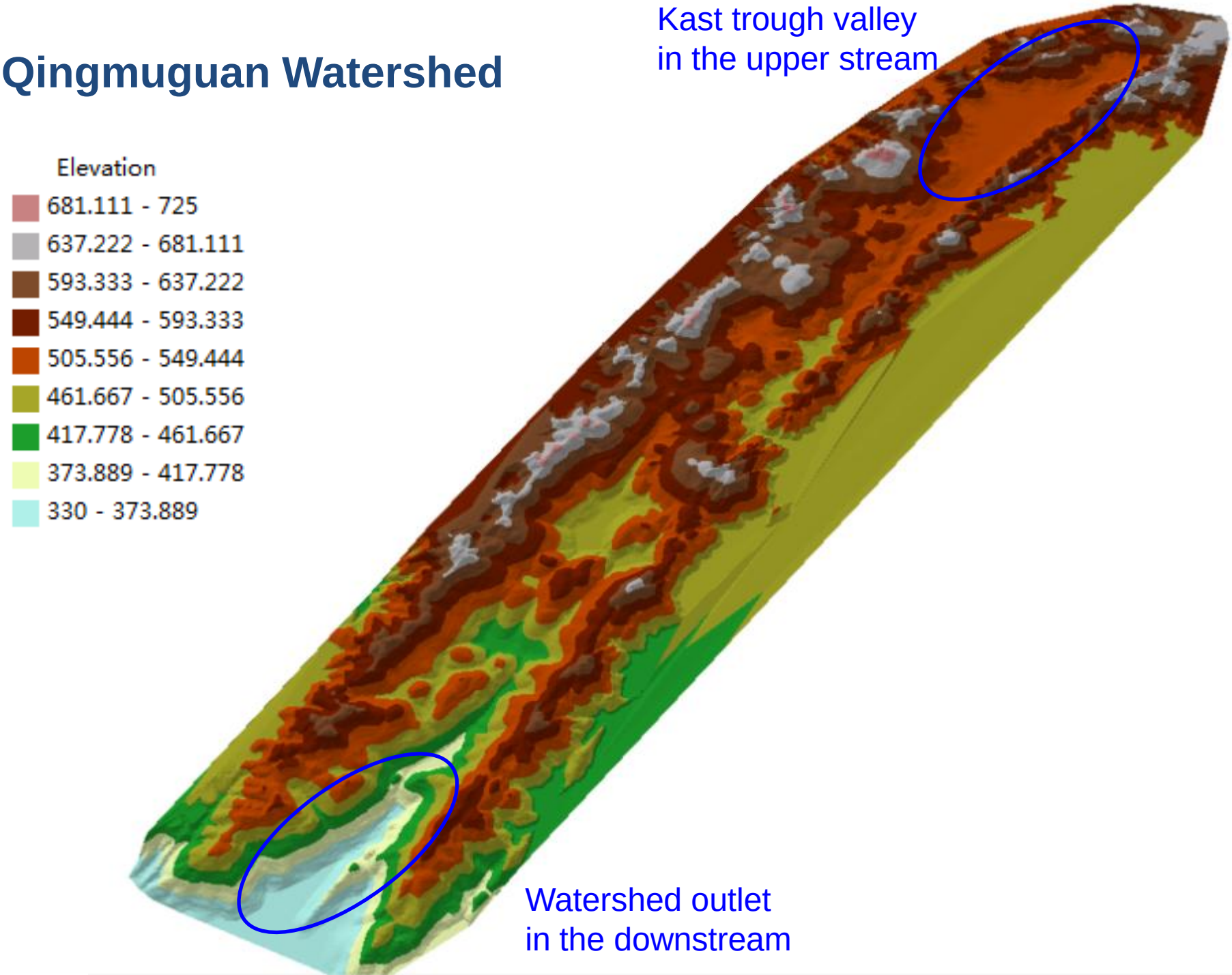
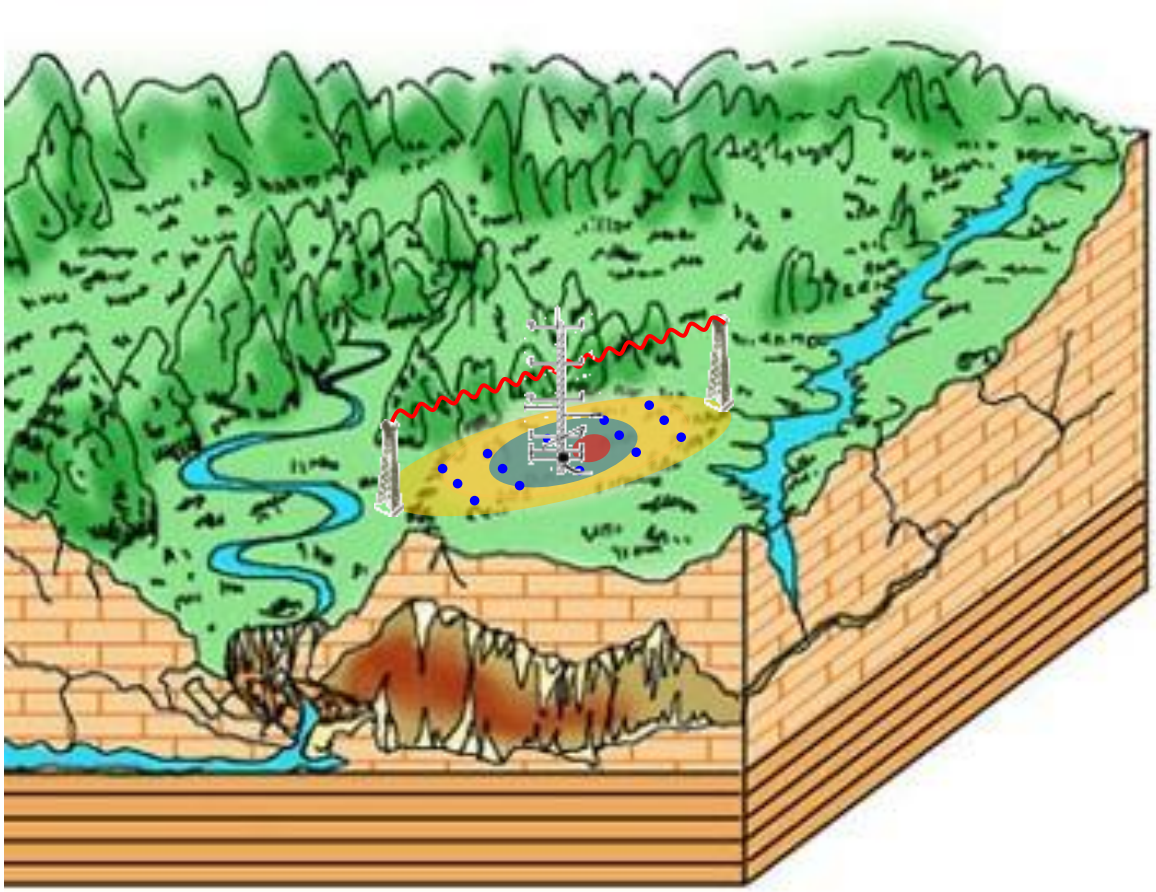
Parallel Ridge-valley Region of the Eastern Sichuan Province belongs to Huayingshan Grand Canyon.

Qingmuguan karst watershed is located in Parallel Ridge-valley Region of the Eastern Sichuan Province. It is the typical karst trough valley landform, which appears as one mountain, two ridges and one trough valley. There is a AWS and EC tower which is close to the Qingmuguan Watershed and belongs to Beijing Forestry University.

Qingmuguan Watershed



Multi-scale observation system



LAS

EC、AWS

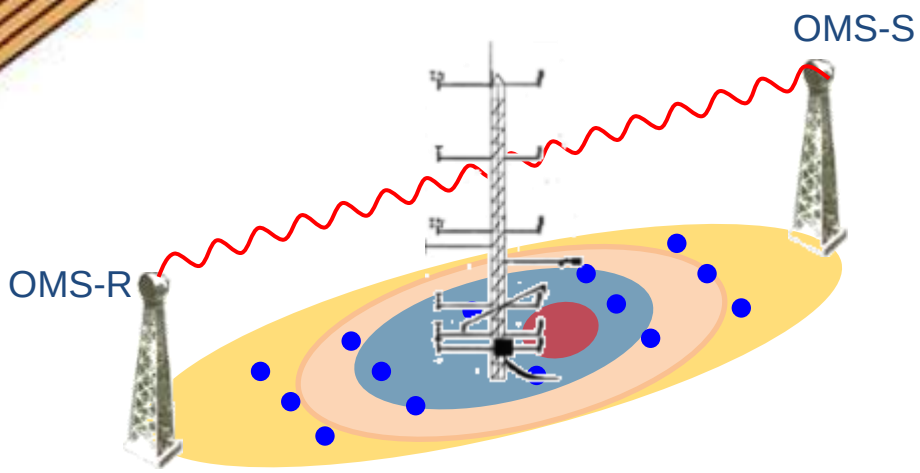
LAS footprint

EC footprint

COSMOS

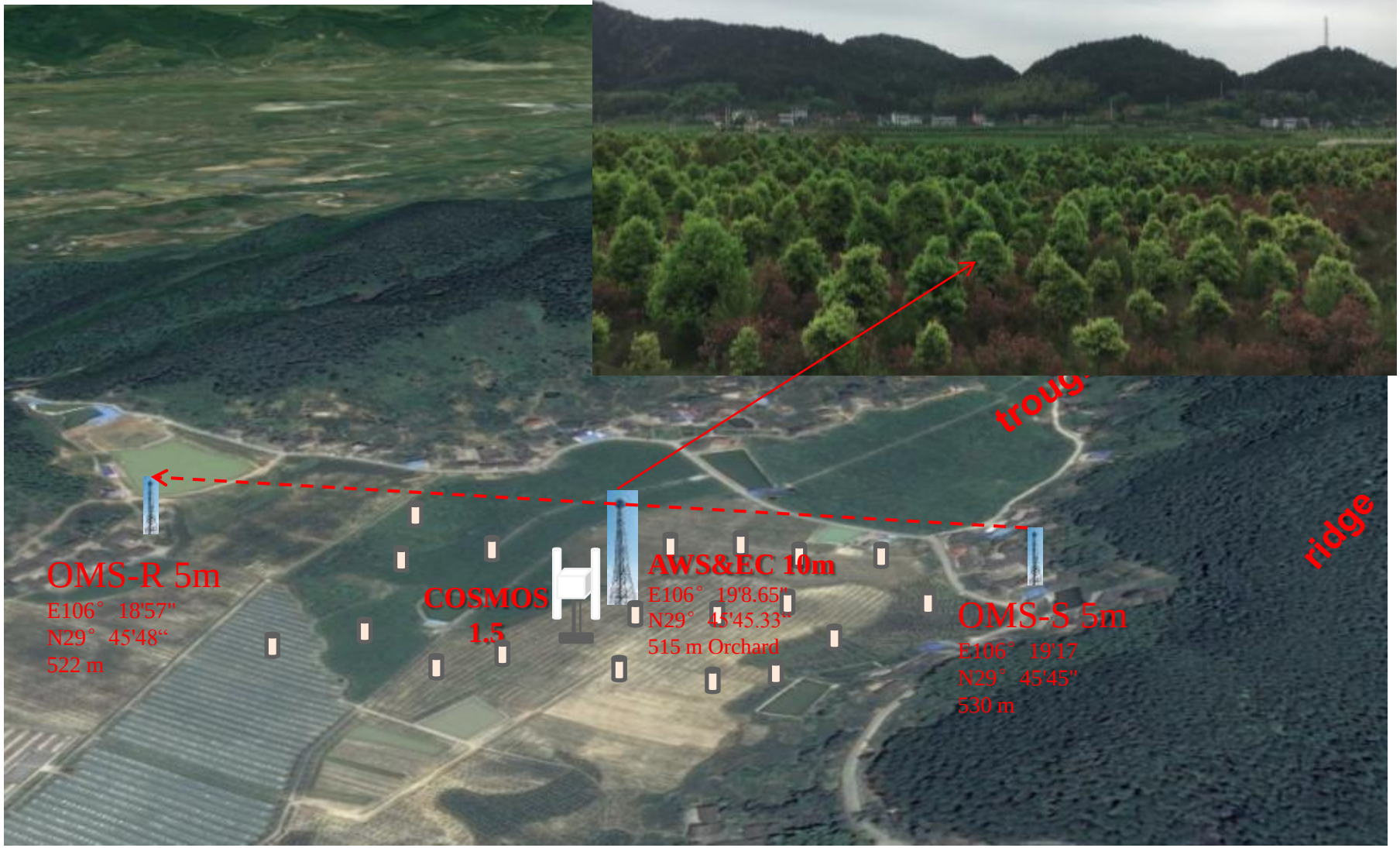
Isotope, soil carbon

WSN



Multi-scale observation s

Kast trough valley in the upper strea

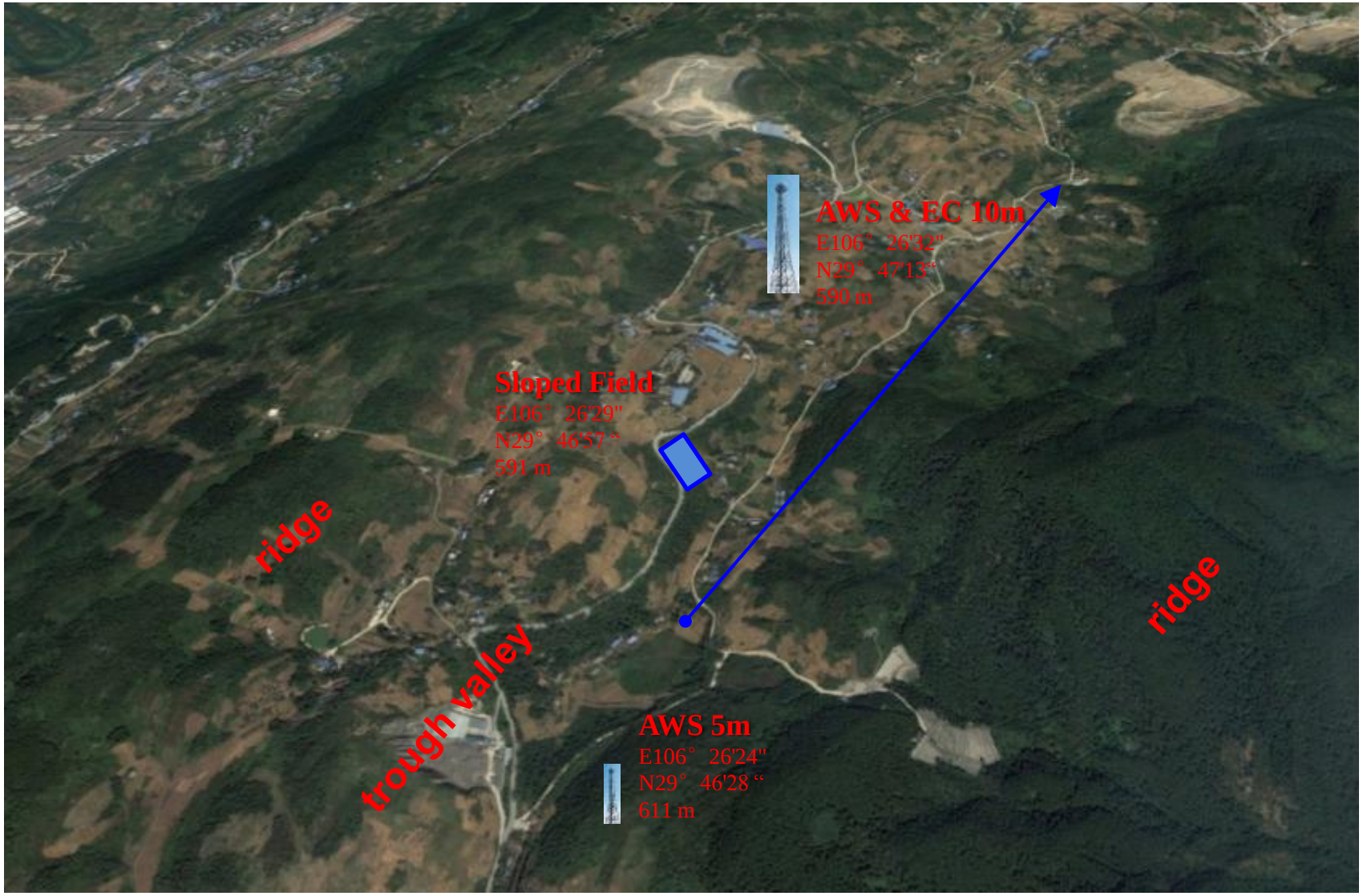


- Wireless Sensor Network (WSN)

Multi-scale observation system

Watershed outlet in the downstream of Qingmuguan Watershed

Zhongliangshan is another typical karst trough valley landform. But it is also widely distributed rocky desertification region because of a high degree of human beings activities.



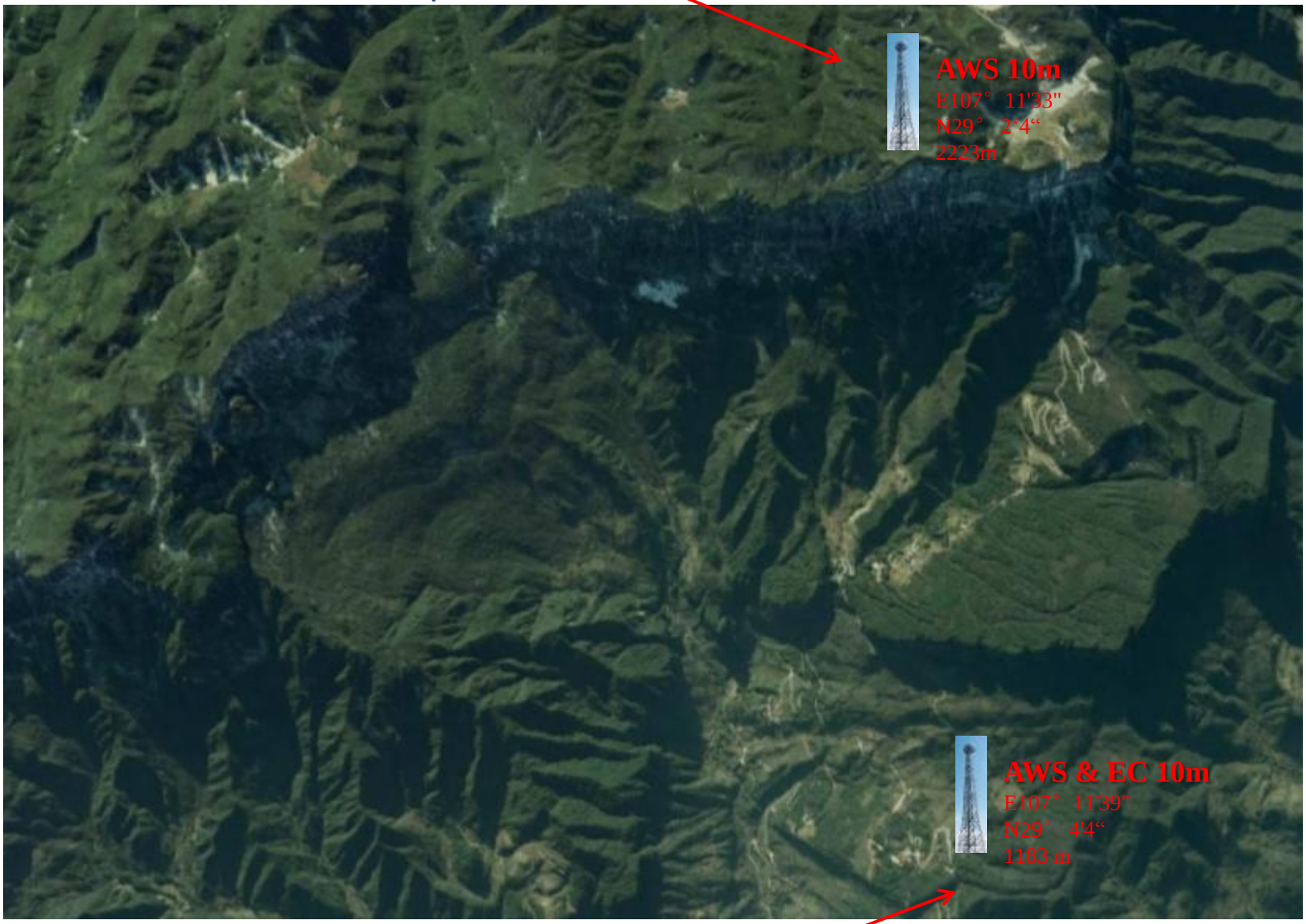
Jinfoshan is very typical ‘Tableland Karst’ in the world.

Karst ecosystem of temperate zone

Sandy shale

Karst ecosystem of subtropical zone

Karst ecosystem of temperate zone



Karst ecosystem of subtropical zone

Multi-scale observation system

EC (3)

LAS (1)

Microwave Scintillation System **(1)**

COSMOS(1)

AWS (4)

WSN(10-20)

A new NSFC project was approved yesterday, which mainly focus on the karst carbon flux in the following 4 years.

(1) Observation and analysis of the carbon flux in the karst regions

(2) Comparison of the carbon flux between the karst and non-karst regions

(3) Validation and improvement of the remote sensed carbon cycle products in the karst regions

(4) Carbon cycle simulation by integrating in-situ and remote sensed observations in the karst regions

3. Conclusions

- The carbon cycle is very important in the karst regions, we need more observations and researches on this topic.

- The observations of the carbon flux in karst regions of Southwest China are very lacking. We will promote this work in Chongqing karst regions.

- We encourage the data sharing among the different stations. We also hope more researches focus on the karst carbon cycle studies.

Thanks for your attention!

School of Geographical Sciences, Southwest University