# Infrasound Records Associated with the Western of Yunnan Fireball on October 4, 2017

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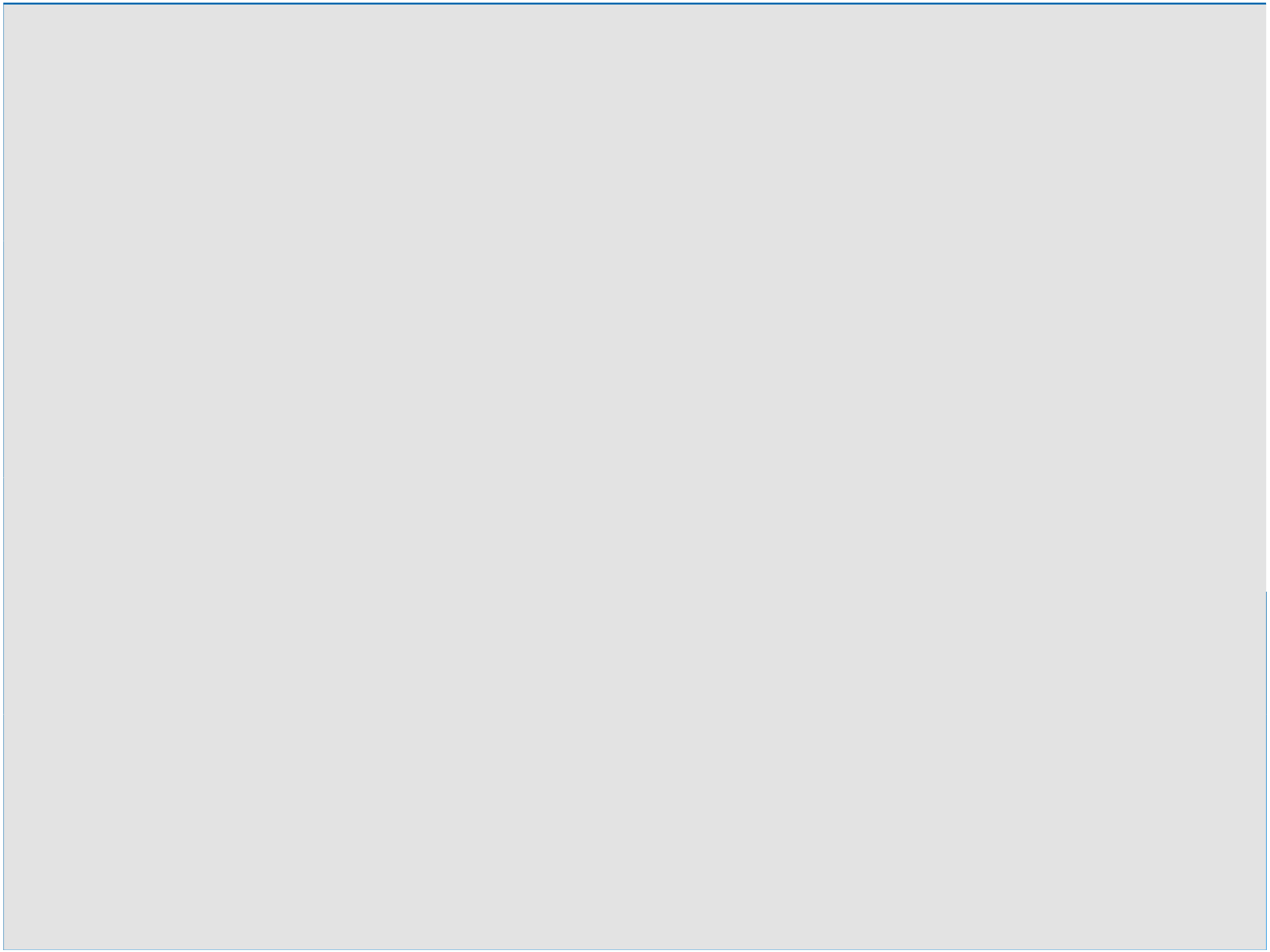
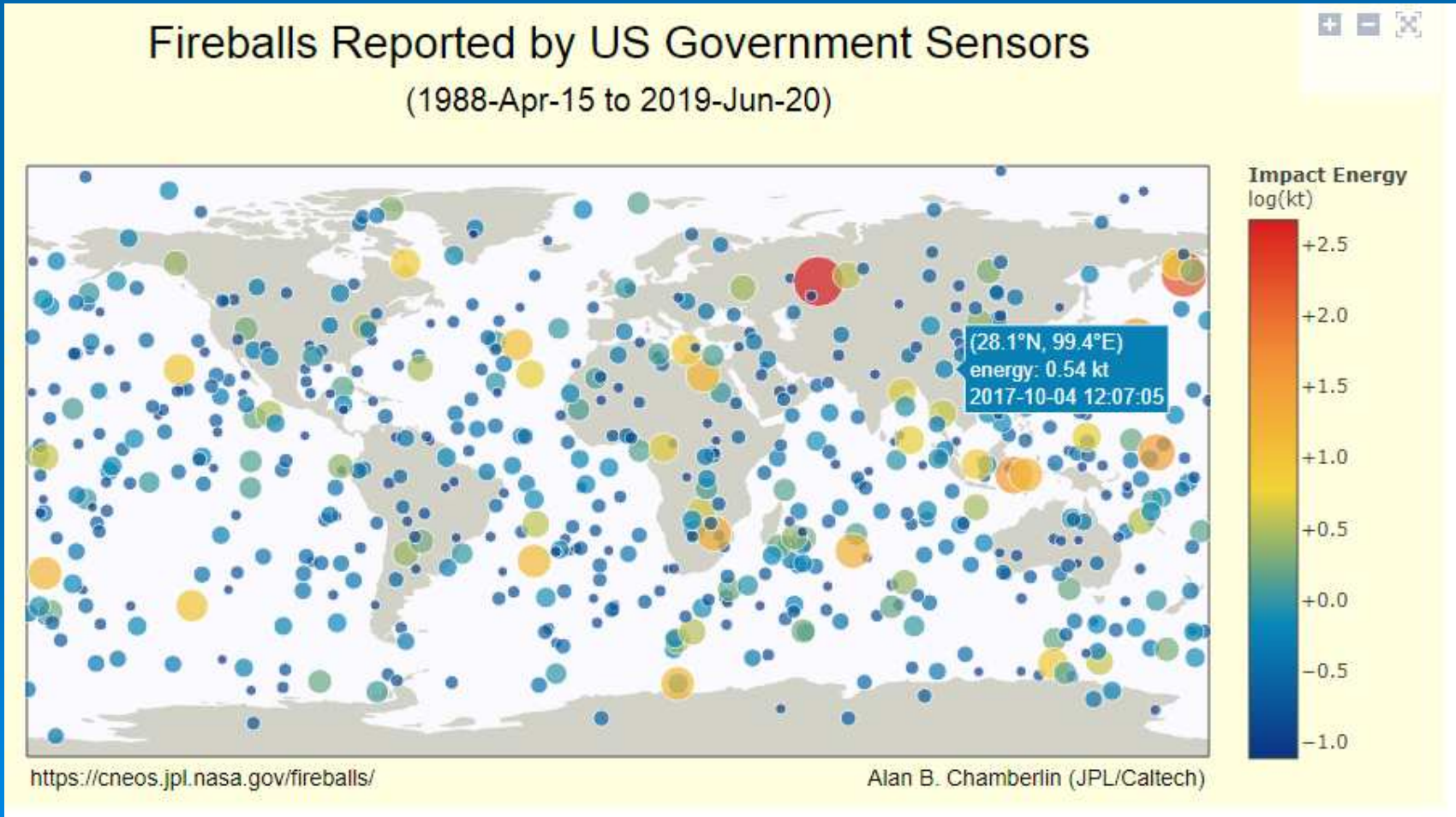
# Outline

- Date source
- Internet and media
- JPL Fireballs reported by US Government sensors
- Infrasound stations of CTBTO and other institute
- The data analysis of two Infrasound Arrays
- Conclusions



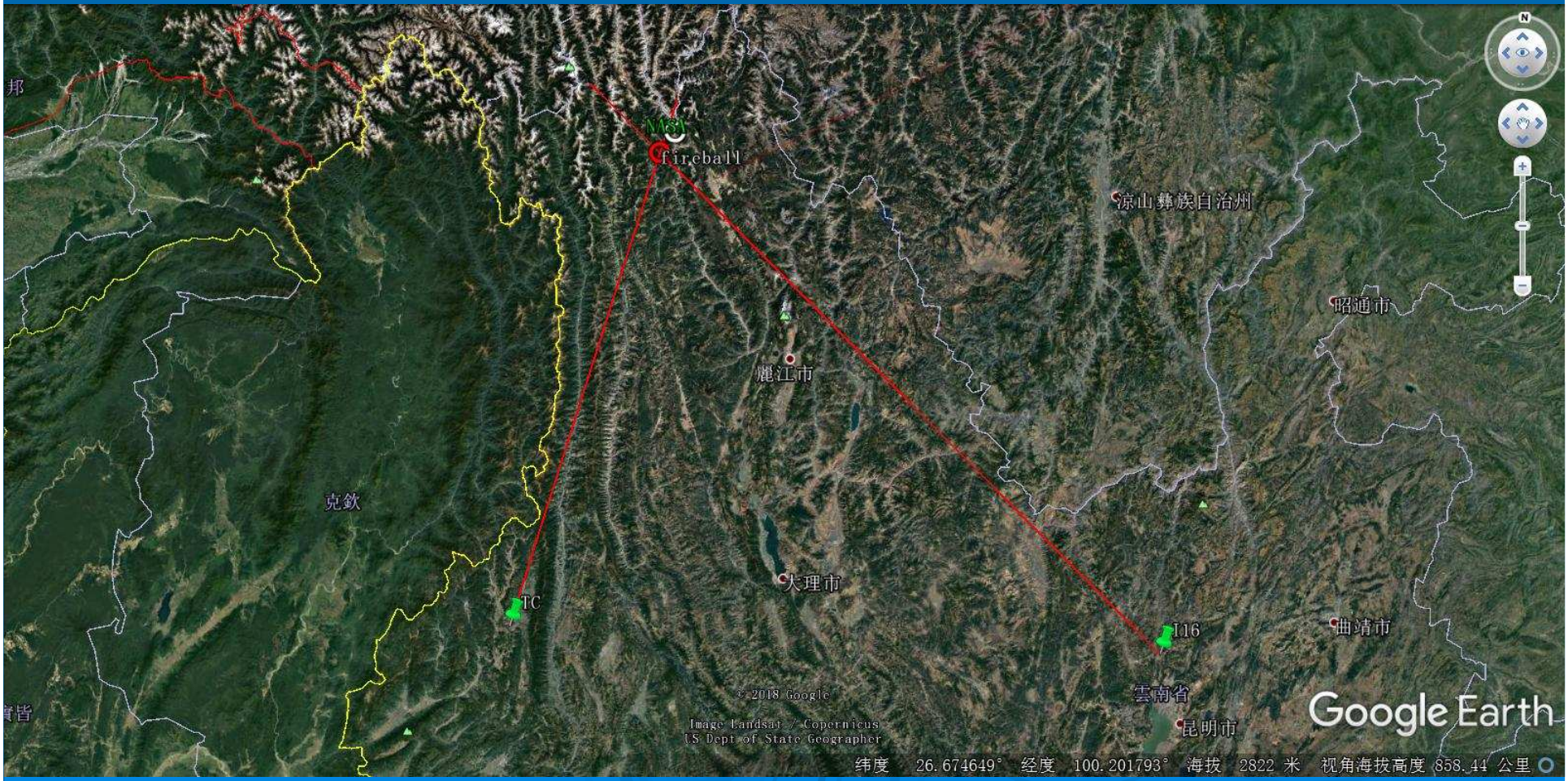
# Data source: JPL Fireballs reported by US Government sensors

The JPL report provided several key information of the fireball,including location,enegy,date and time et.al.



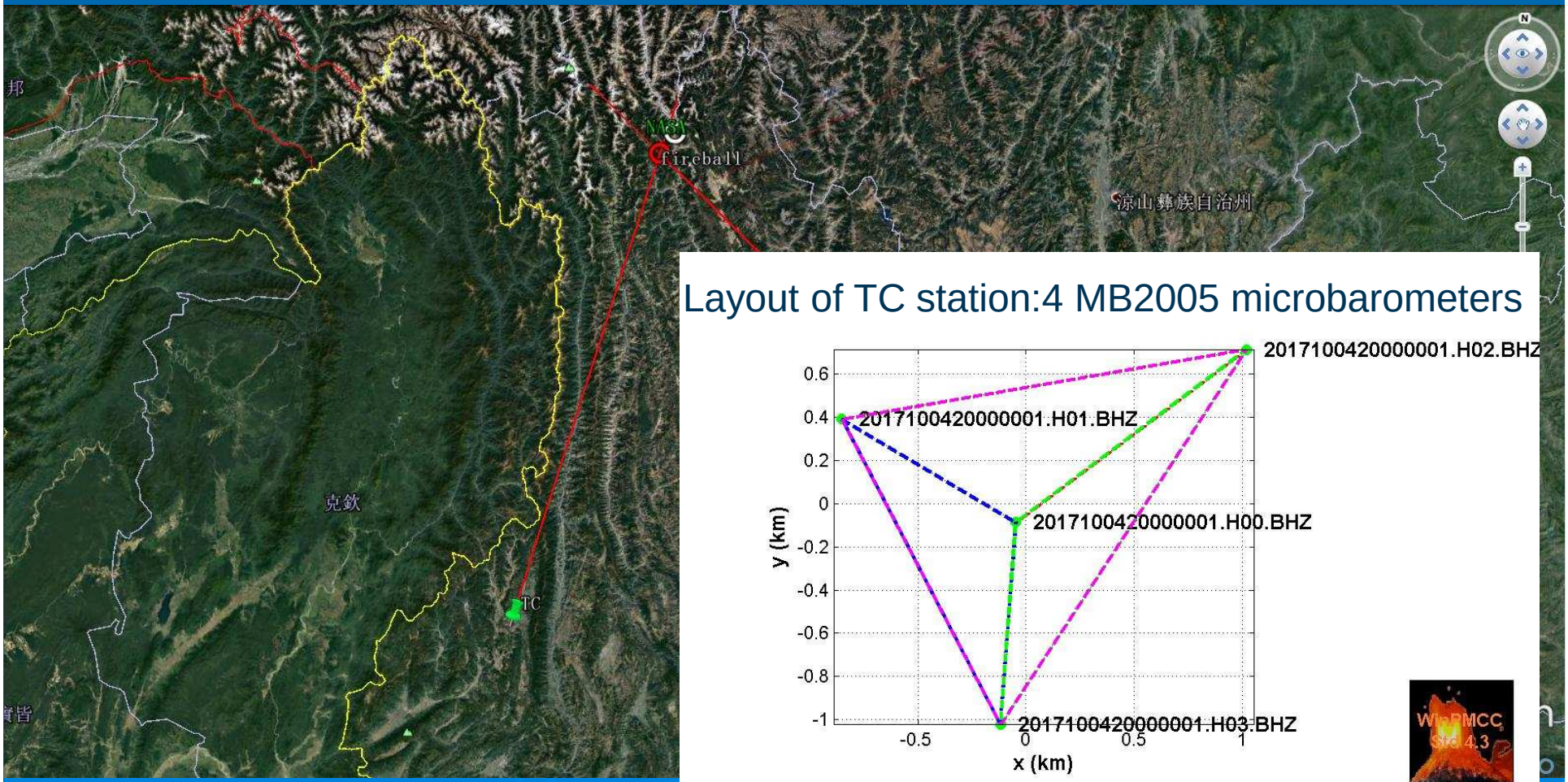
# Data source: Infrasound stations of TC and I16 (IMS)

Infrasonic signals of the fireball were observed by TC infrasound station located in the western of Yunnan province and I16 infrasound station (IMS)and the distances between the stations and the hypothesized source region are 314 km(TC) and 450 km(I16),respectively.



# Data source: Infrasound station of TC

~314 km from the hypothesized source region

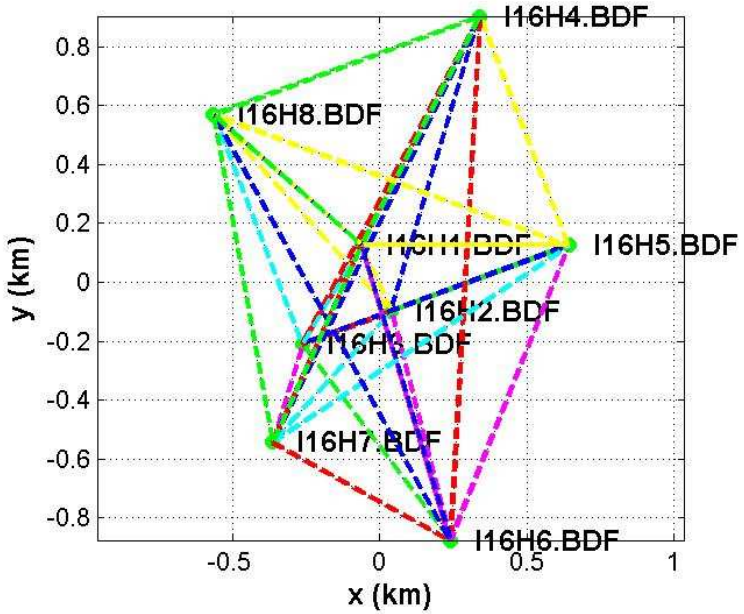


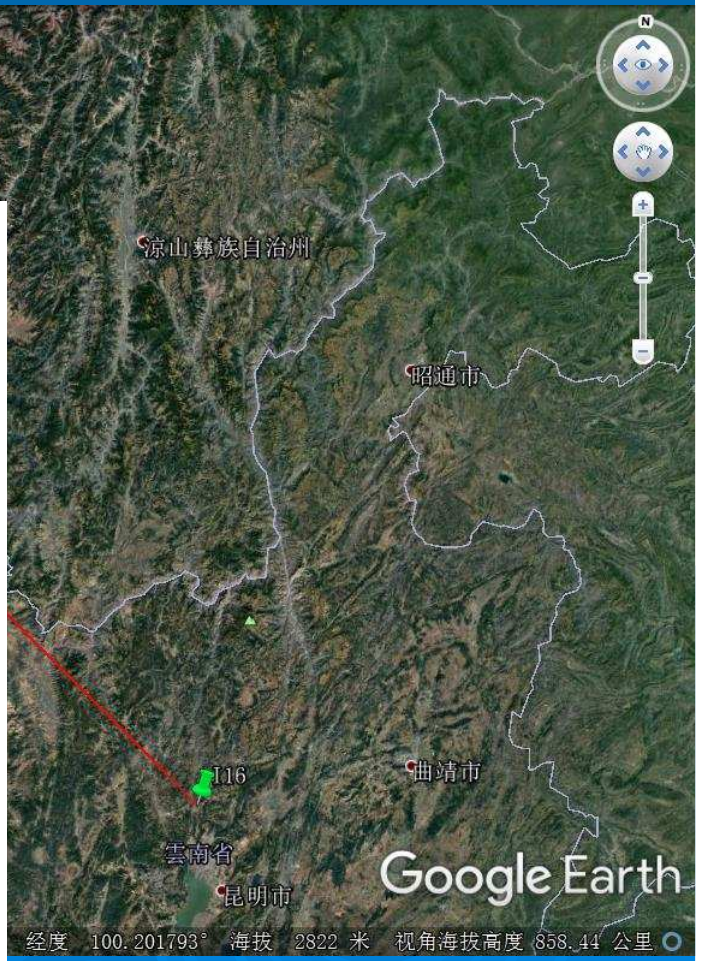

## Layout of TC station:4 MB2005 microbarometers

# Data source: Infrasound station of I16 (IMS)

~450 km from the hypothesized source region

## Layout of I16 station:8 MB2005 microbarometers



# The data analysis of two Infrasound Arrays

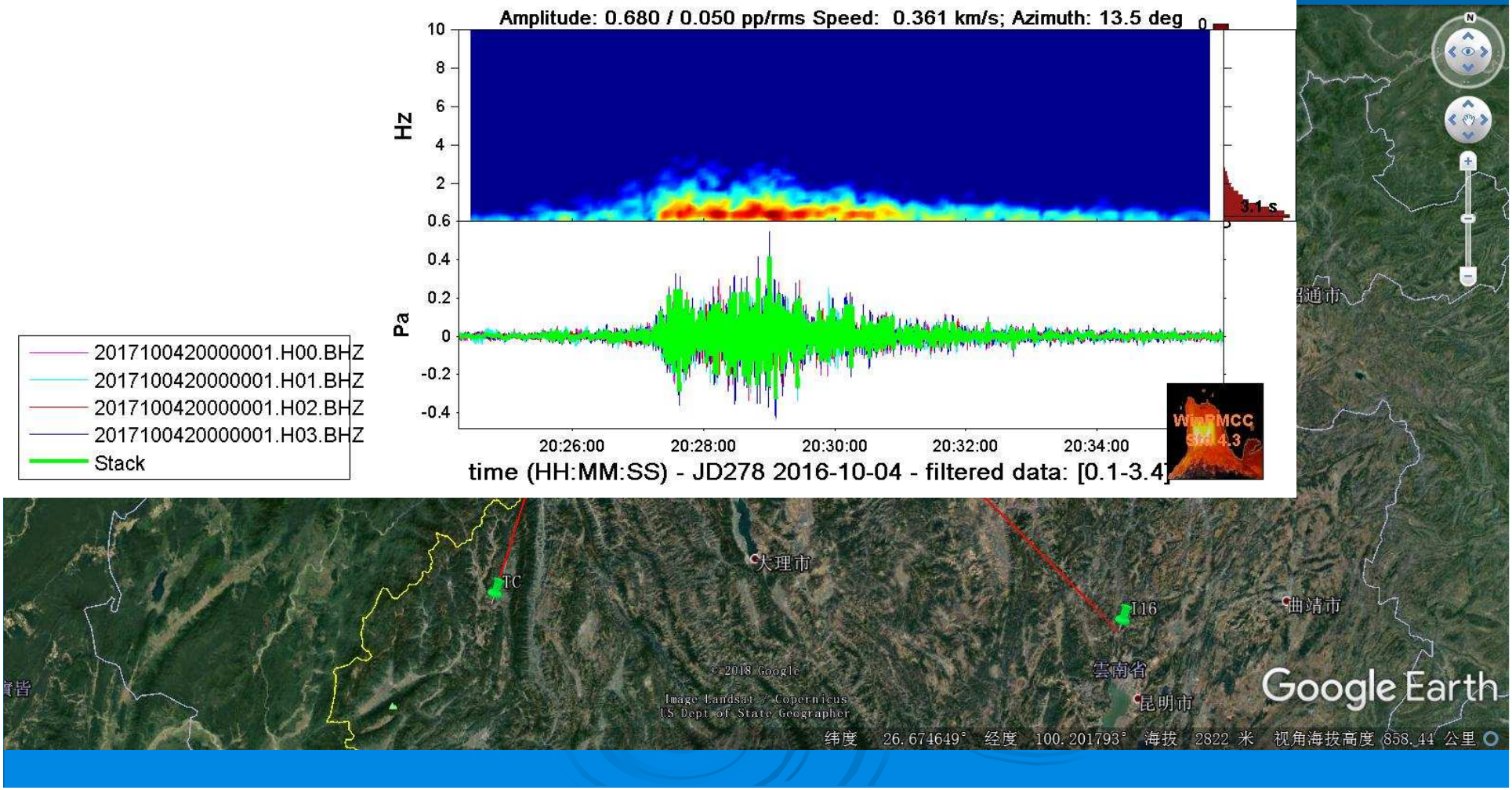
- The progressive multi channel correlation (PMCC, Cansi 1995;Matoza et al. 2013) method was used to estimate the acoustic wave parameters at the two infrasound arrays. The PMCC is provided by CEA/DASE and the I16(IMS) data are provided by China NDC.
- We estimate the energy (E) from the period (P, in seconds) using the following empirical formula (ReVelle 1997):

$$\log_{10}\left(\frac{E}{2}\right) = 3.34\log_{10}(P) - 2.58 \qquad E/2 \leq 100\,\mathrm{kt} \qquad (1)$$

# The data analysis of two Infrasound Arrays : TC station

~314 km from the hypothesized source region

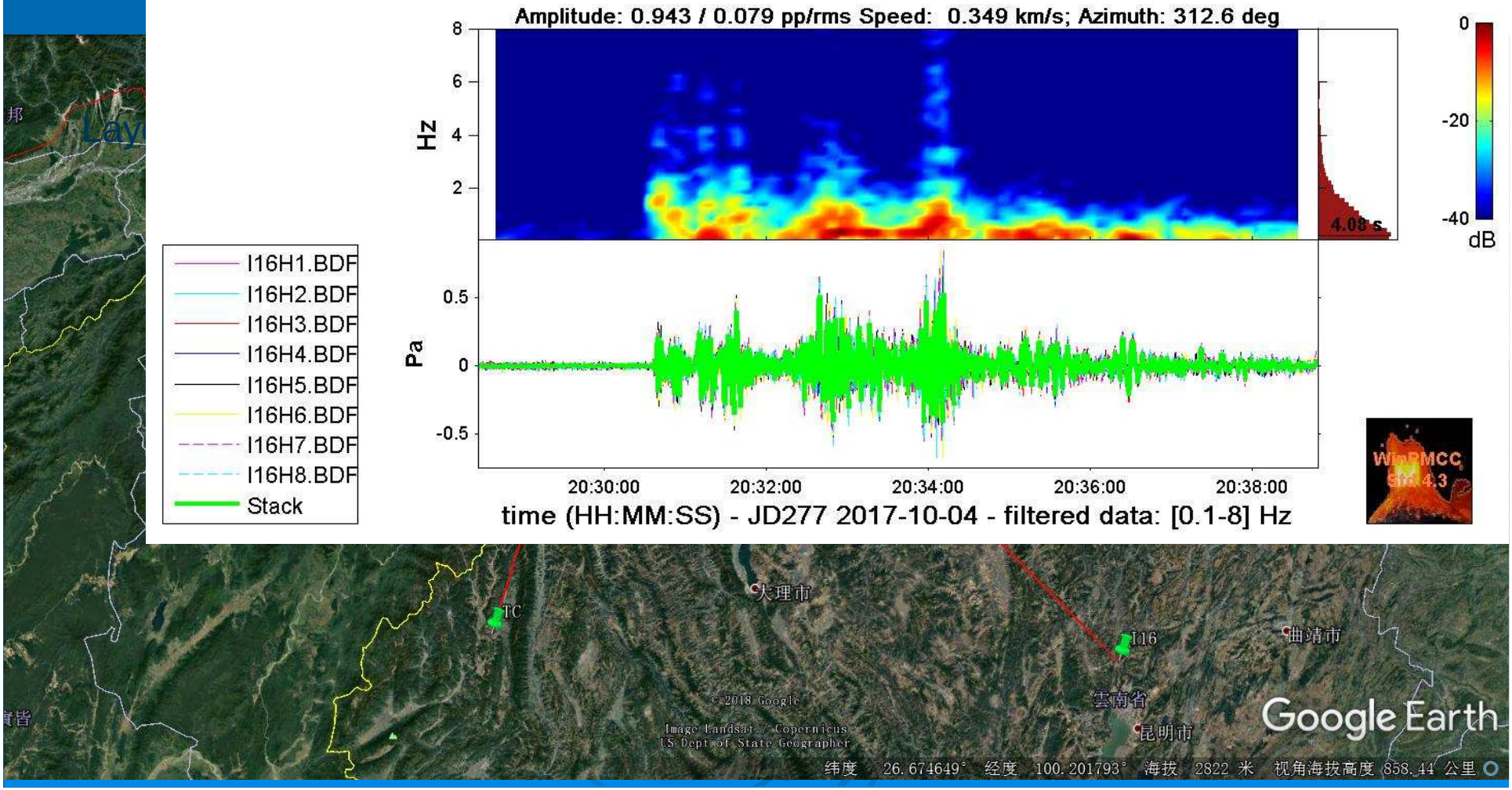
## Results of PMCC analysis of TC array



# The data analysis of two Infrasound Arrays : I16 (IMS) station

## ~450 km from the hypothesized source region

### Results of PMCC analysis of IMS I16 station

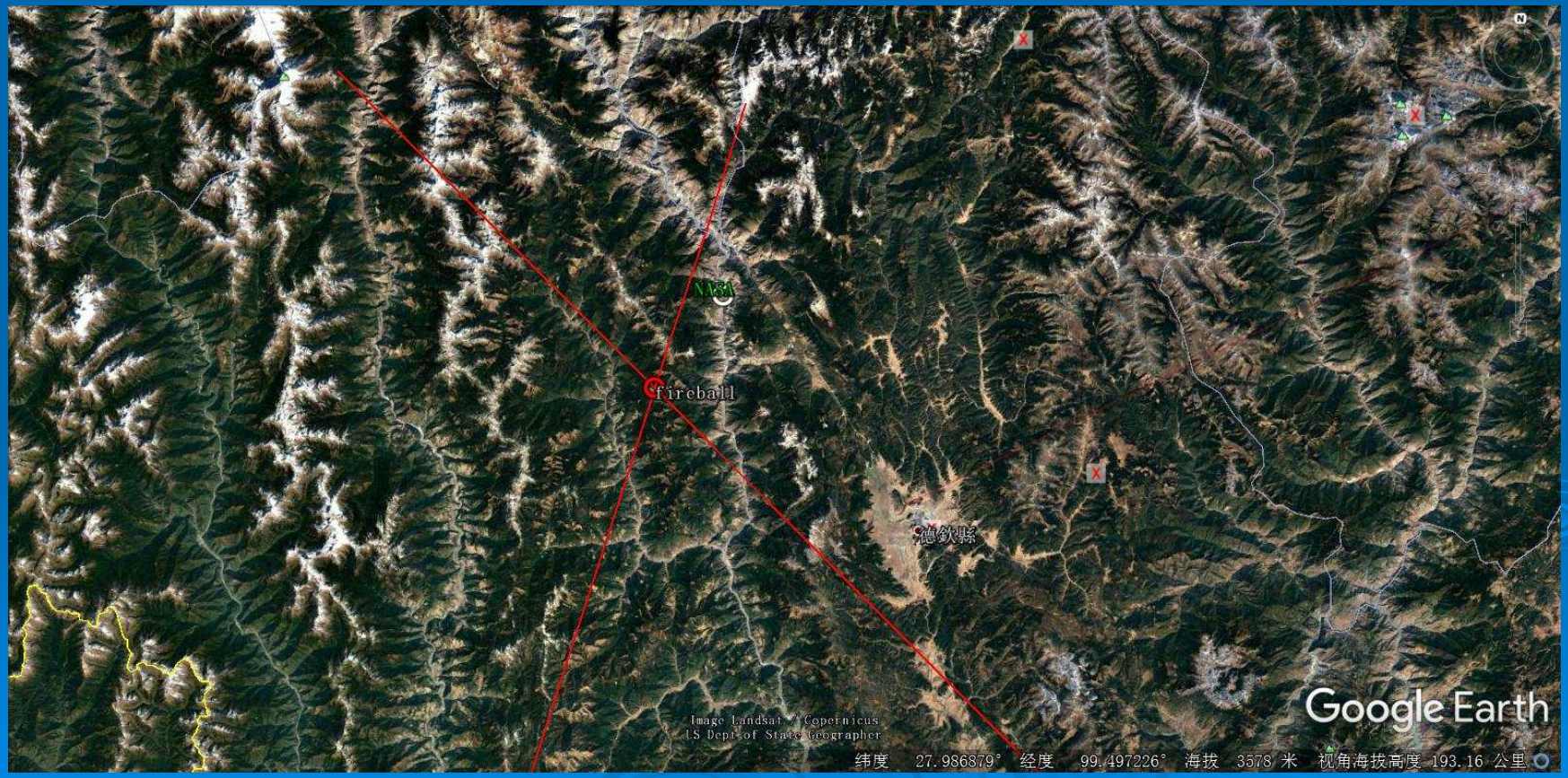


## Table 1 Detection parameters table

| Station | Distance (km) | Observed arrival time (Beijing time) | Observed back azimuth (◦) | Trace velocity (m/s) | Max amplitude (PP,Pa) | Period at max amplitude (s) | Total energy (kt) | JPL energy (kt) | JPL origin time (UTC) |
|---|---|---|---|---|---|---|---|---|---|
| TC | 314 | 20:25:15 | 13.5 | 0.361 | 0.68 | 3.1 | 0.23 | 0.54 | 12:07:05 |
| I16 | 450 | 20:29:18 | 312.6 | 0.349 | 0.943 | 4.08 | 0.58 | | |

# Source location: the back azimuth intersection of two Infrasound Arrays

The source location (99.31E,27.97N,red circle) was determined by the back azimuth intersection of two imfrasound arrays, which is only 17 kilometers away from NASA's location ( 28.1N, 99.4E,white circle)



# Conclusions

- The source location (99.31E,27.97N,red circle) was determined by the back azimuth intersection of two imfrasound arrays, which is only 17 kilometers away from NASA's location.
- The energy of the fireball is estimated to be about 0.4 kilotons(the average of two infrasound energy).
- This fireball event show that the large fireballs are easy to detected by infrasound station and are consistent with Internet and media reports and US government sensor reports.
- The combined data analysis of regional infrasound stations and IMS stations is helpful to detect and locate small energy (E<1kt)of fireball events.

- Thank you.