NCA Dust Indicator

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(Picture Credit: blog.maricopanewhomes.net)

The "Dust Bowl"

◆ **Dust Bowl: A period of severe dust storms in the 1930s;**

◆ **Causes: Extended droughts & poor land management;**

◆ **Impacts:**

   ✓ **Stripped ~75% of top soils;**

   ✓ **400,000 – 2.5 millions lost homes;**

   ✓ **Destroyed agriculture and ecosystem (~1950s);**

TX-1935

OK-1936

SD-1936

"And then the dispossessed were drawn west--from *Kansas, Oklahoma, Texas, New Mexico*; from Nevada and Arkansas, families, tribes, dusted out, tractored out... They streamed over the mountains, hungry and restless--restless as ants, scurrying to find work … anything, any burden to bear, for food. The kids are hungry. We got no place to live…"

-- John Steinbeck in the Grapes of Wrath

Will US see another Dust Bowl?

◆ **Paleoclimatic records – Central Plains saw severe droughts about once or twice a century over the past 400 years (Woodhouse and Overpeck, 1998).**

◆ **This recurring trend may be enhanced by global climate change (Schubert et al., 2004).**

◆ **There is no long-term dust climatology in the US.**

Eighty years have passed since the Dust Bowl, will US see another severe drought or dust bowl in the coming decades?
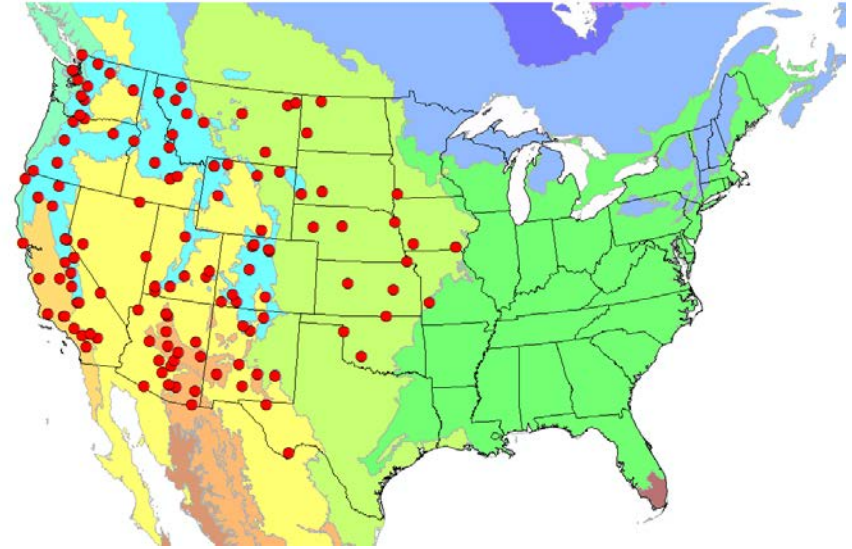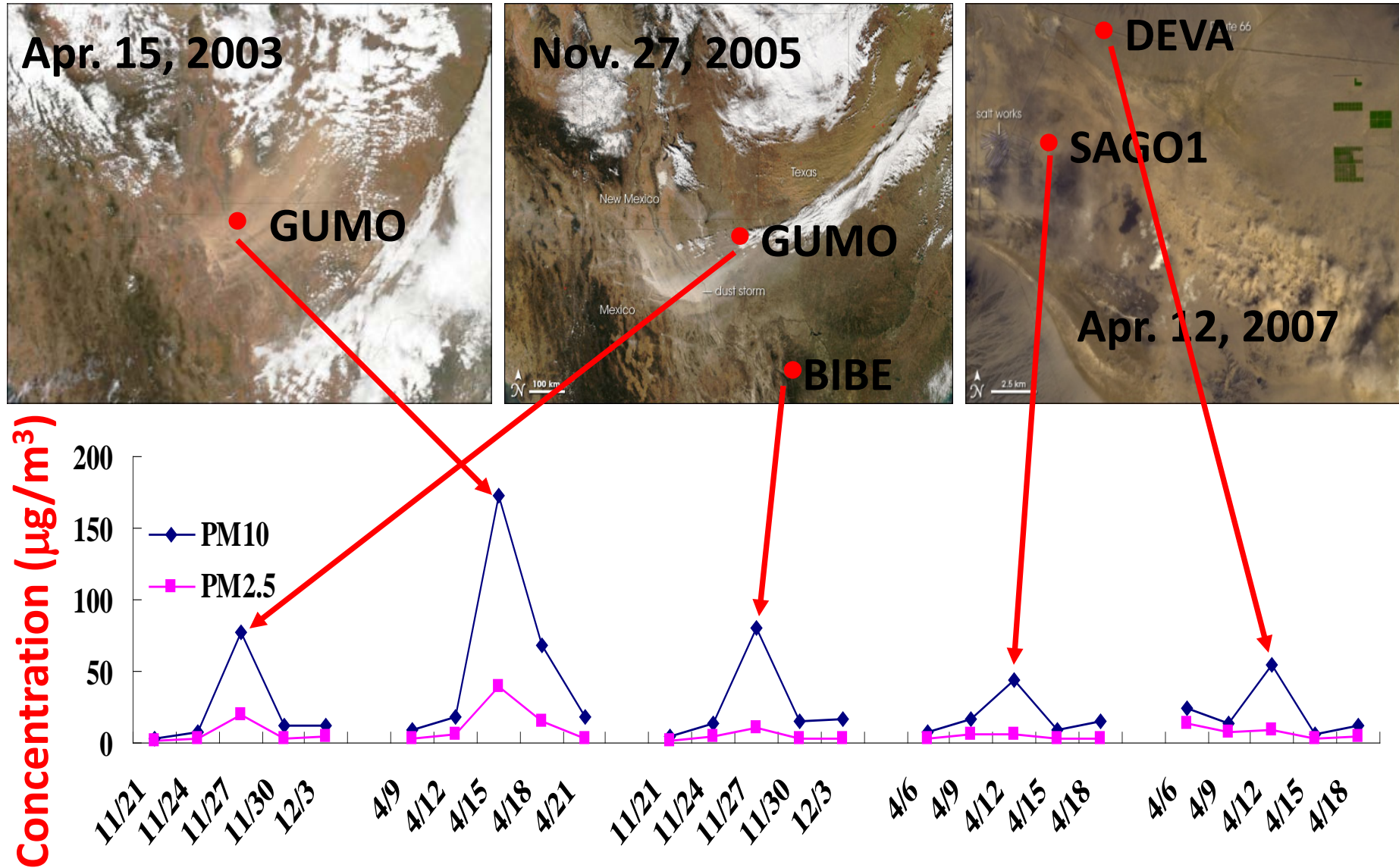
How to Develop a Dust Storm Data Set?
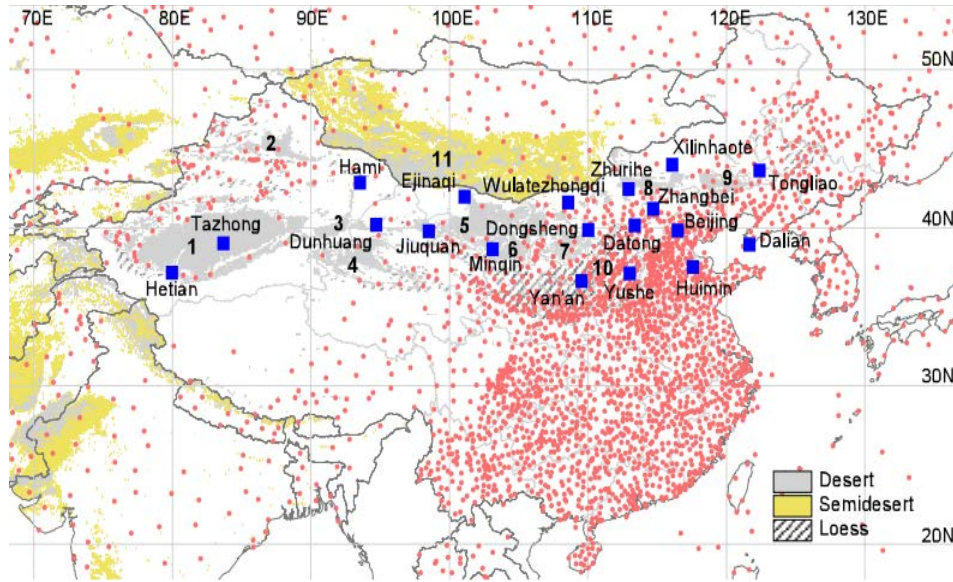
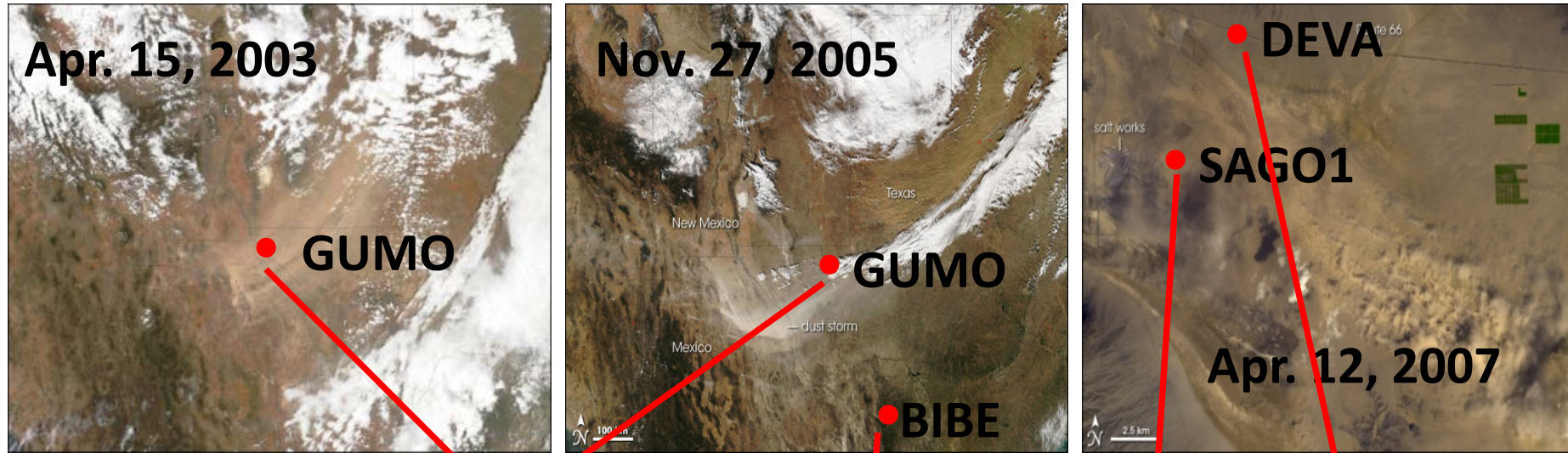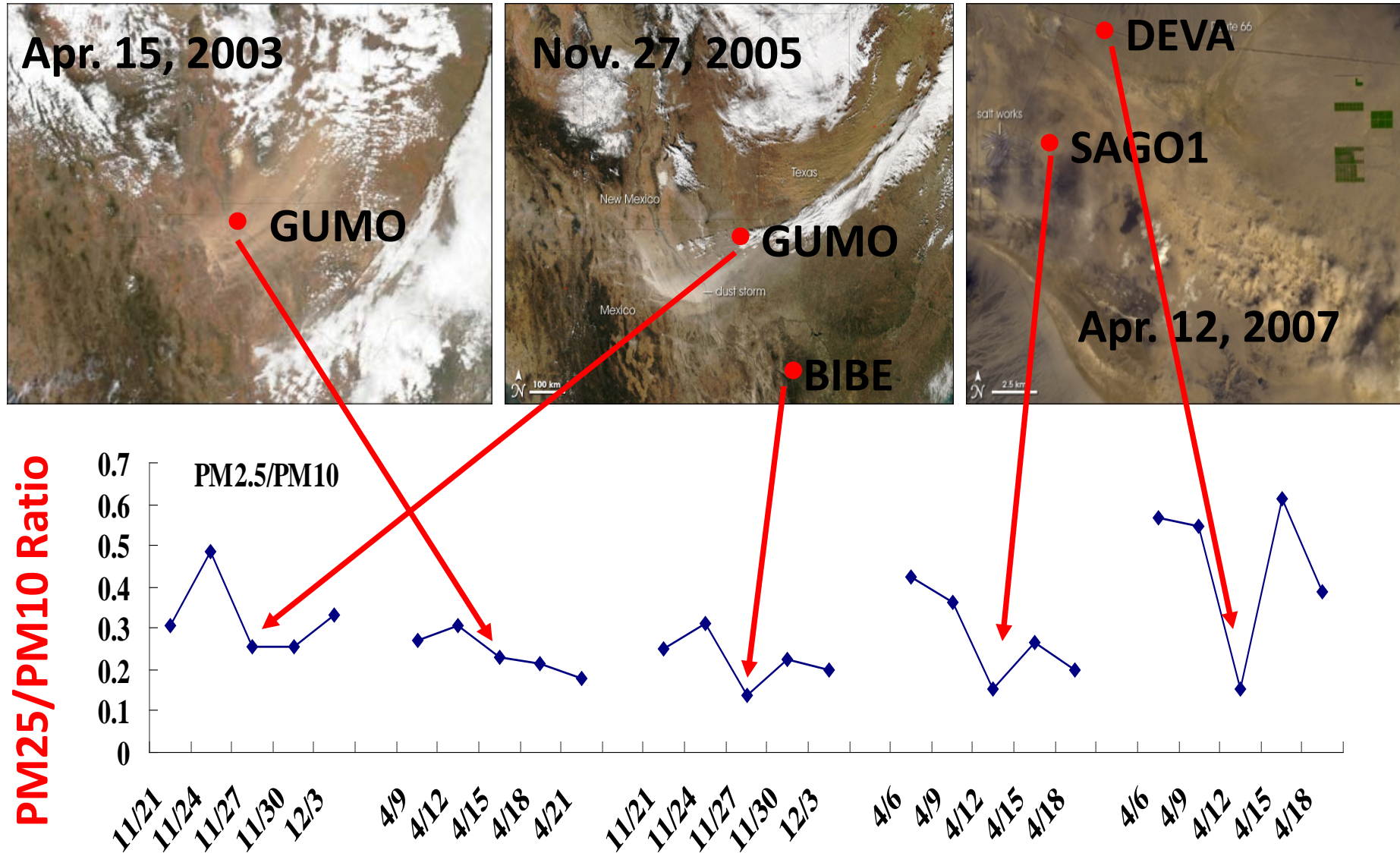**Chinese Sand and Dust Network**

(Wang et al., 2008)

The US Aerosol Network IMPROVE

Satellite-aided Algorithm Development

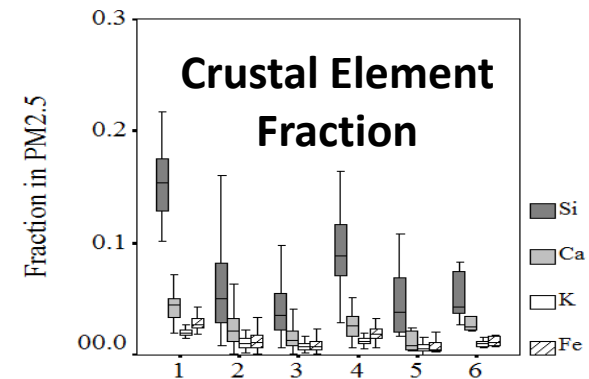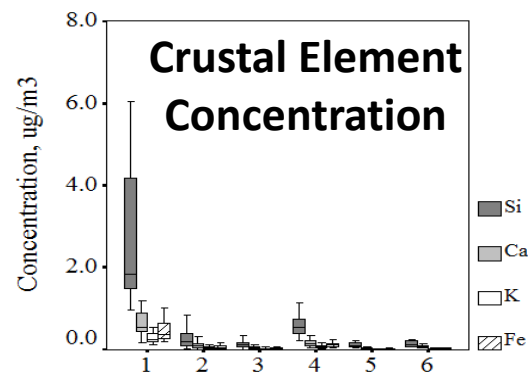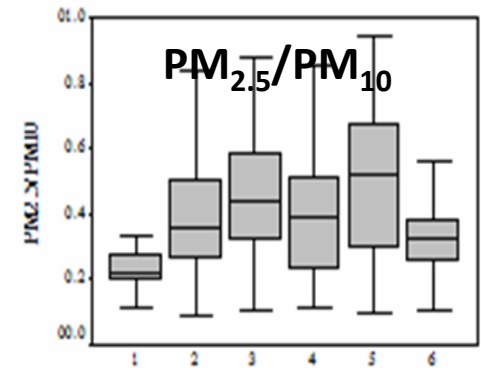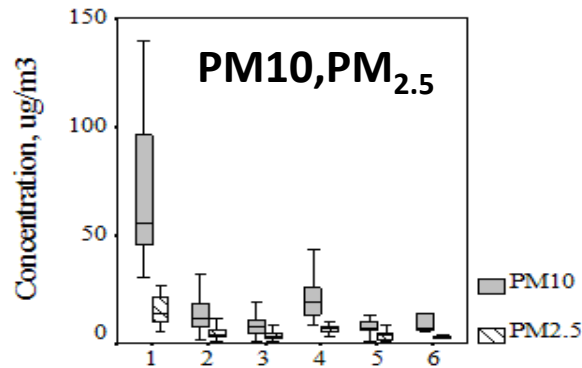# Satellite-aided Algorithm Development
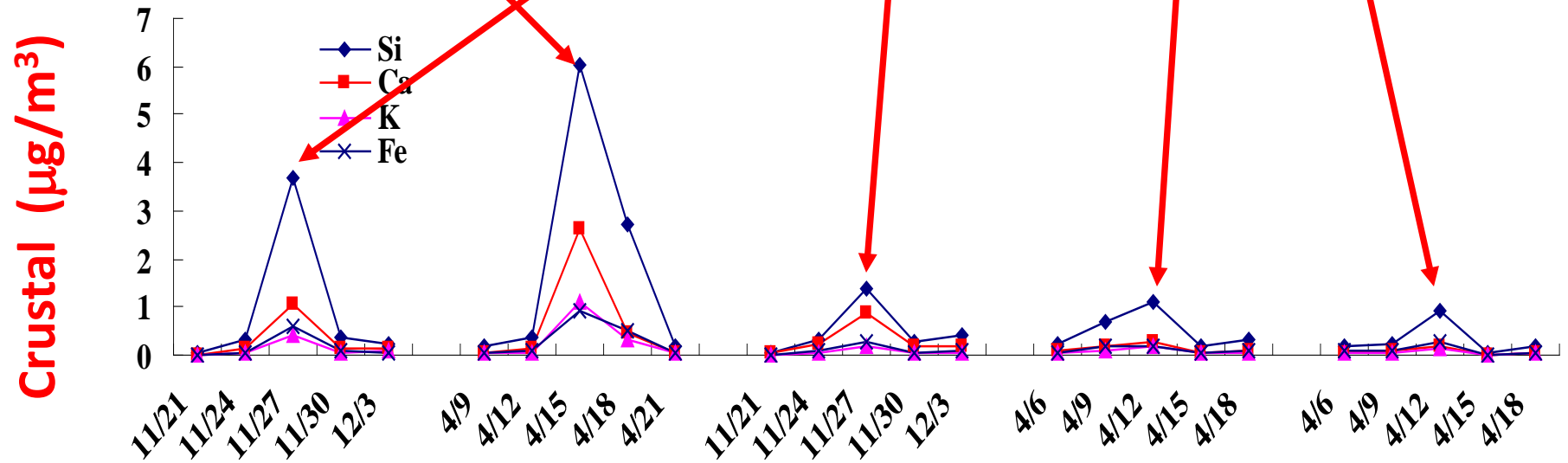
Satellite-aided Algorithm Development

Dust Identification through Cluster Analysis

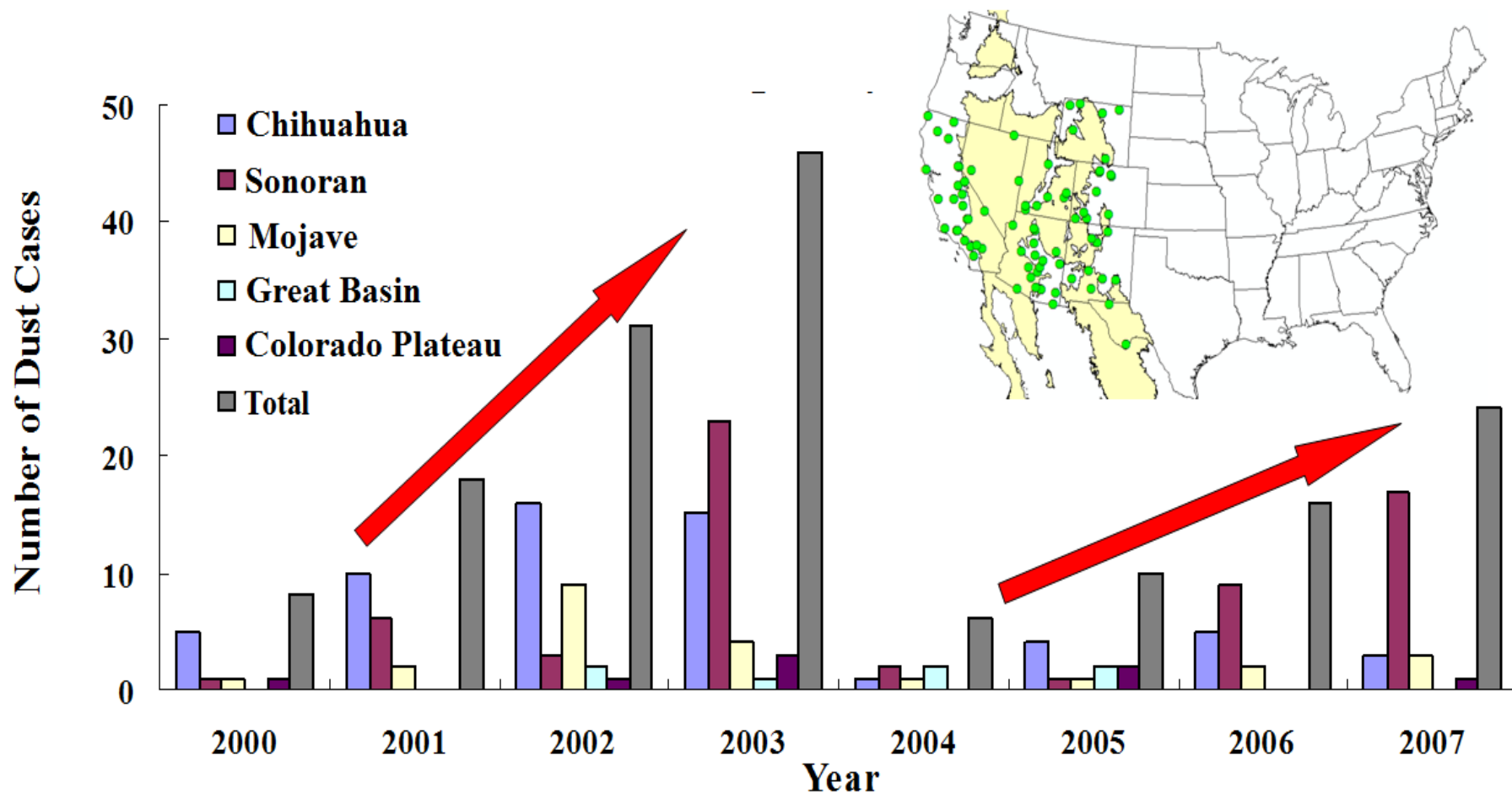**Five Dust Indicators:**

- ❖ **High PM10, PM2.5**
- ❖ **Low PM2.5/PM10 ratio**
- ❖ **High Crustal Fraction**
- ❖ **Low anthropogenic Fraction;**
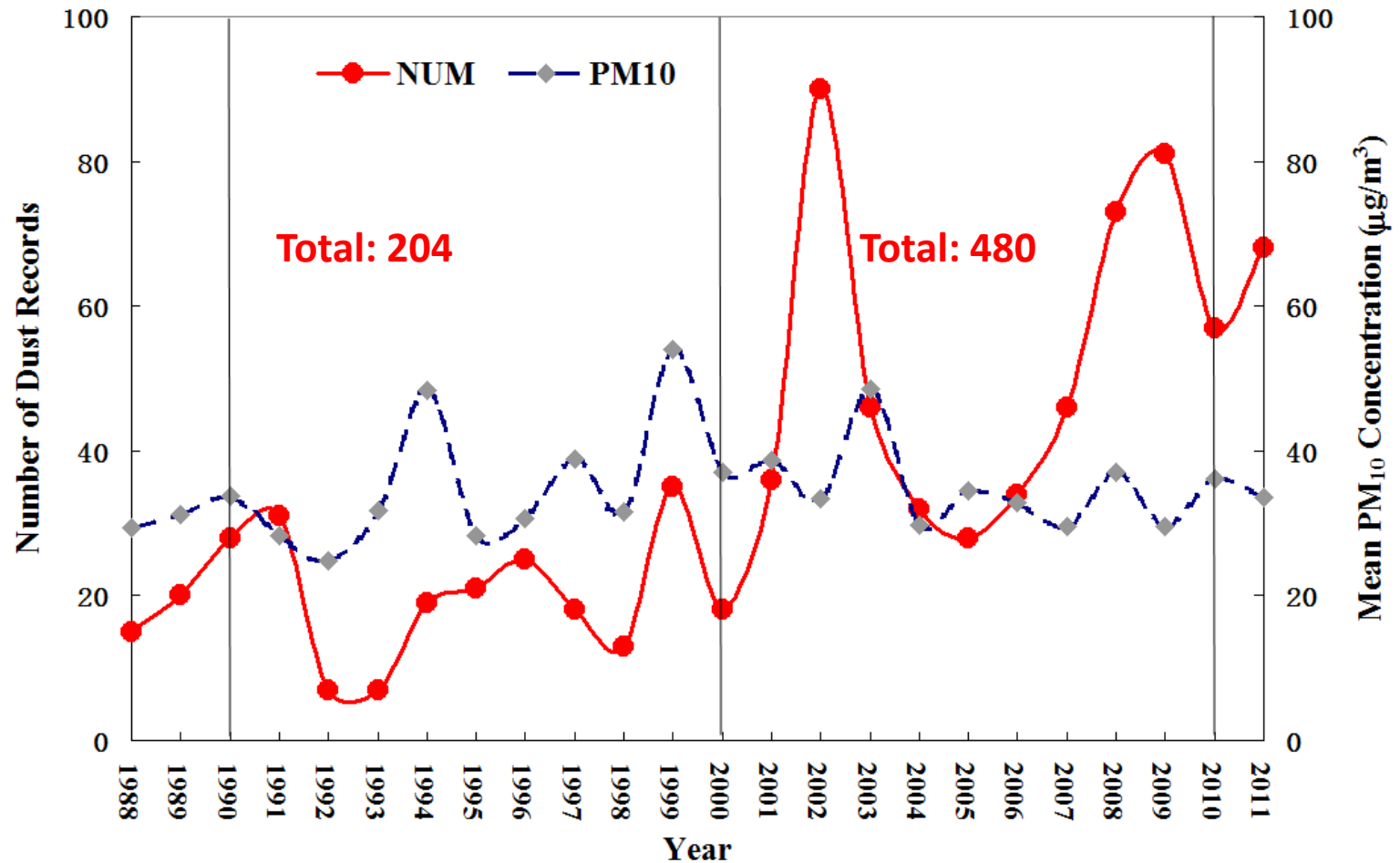- ❖ **Low Enrichment Factor;**
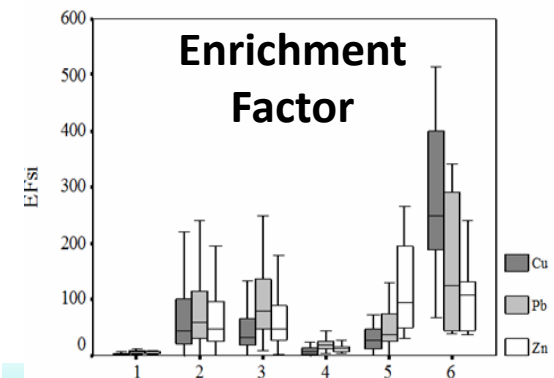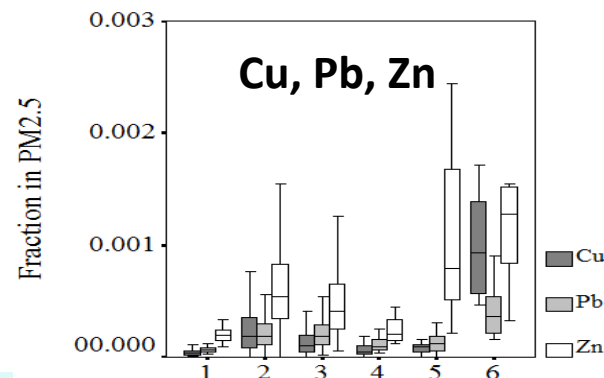
Major Dust Sources over the U.S.

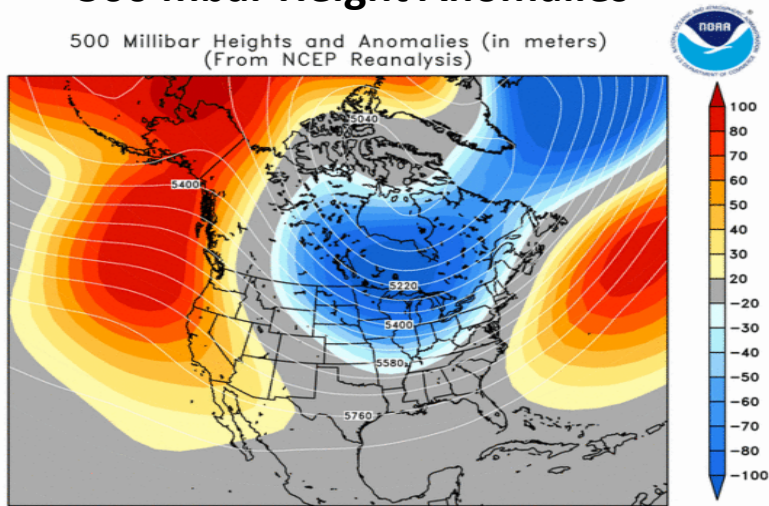**(Tong et al., Atmospheric Chem. & Physic. , 2012)**

Long-term dust climatology

Number of dust storms doubled.

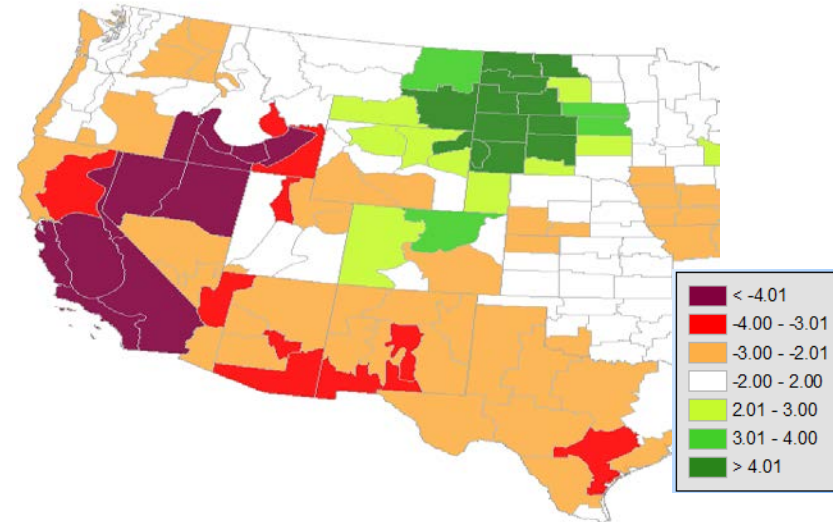**Magnitude of dust storms unchanged;**

2014 sees record high dust

500 mbar Height Anomalies

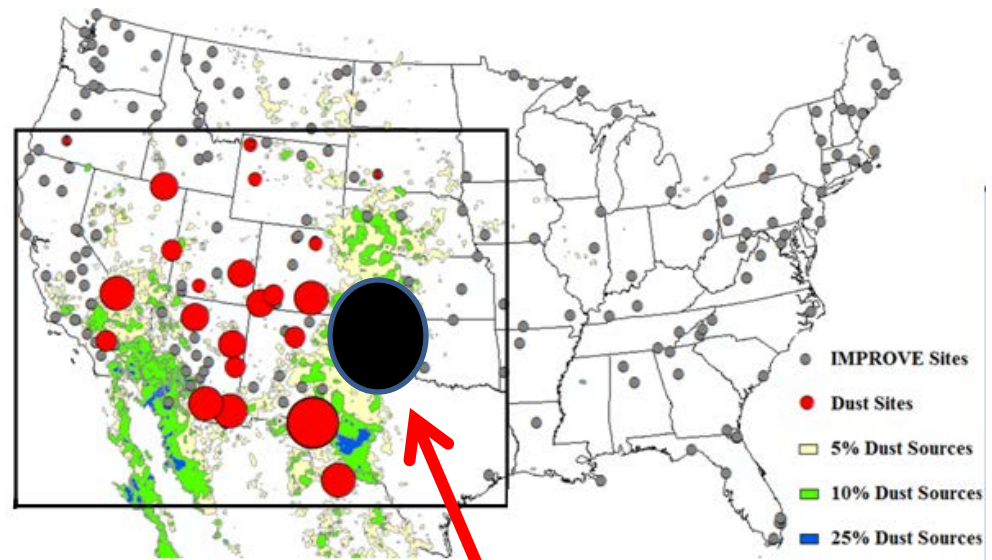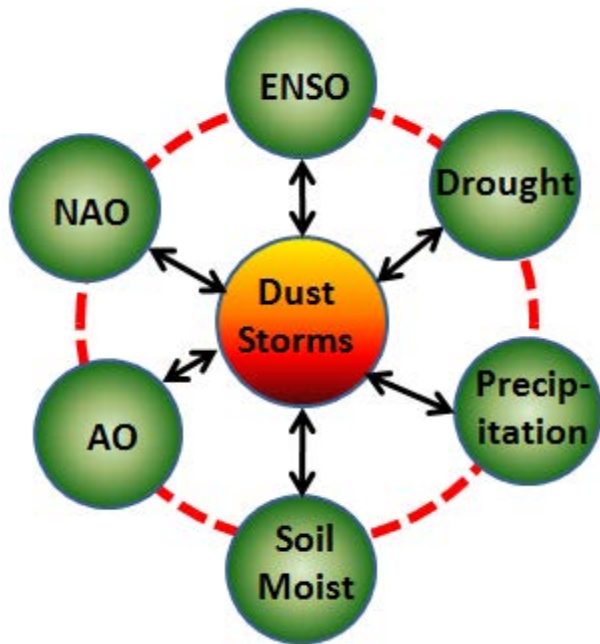**Palmer Drought Severity Index (PDSI)**

Dust Observations from Seven Satellites
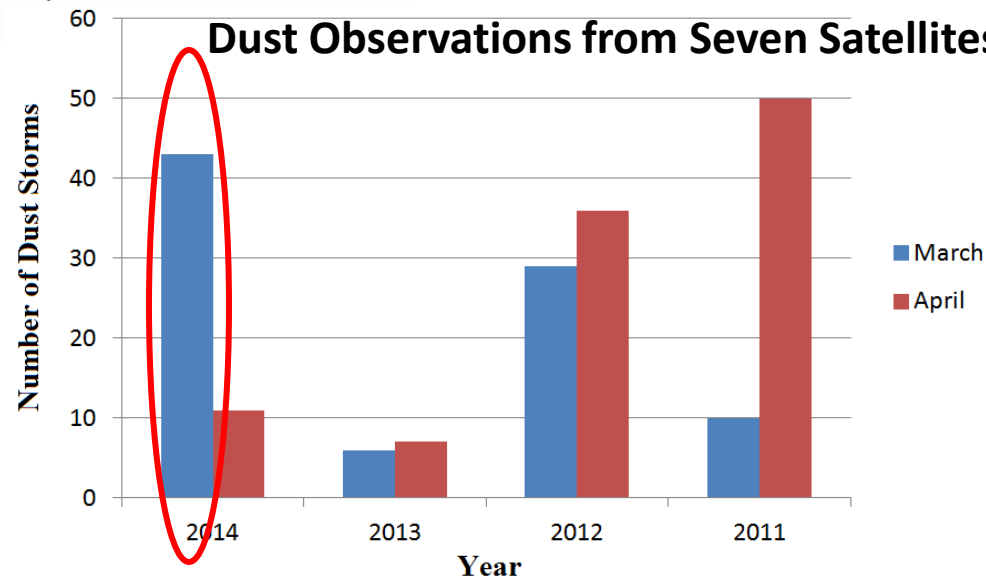
Open Questions:

✓ **What is controlling the dust trend?**

✓ **Is the increasing trend an early indicator to another Dust Bowl?**

Last Dust Bowl

Future Plan

☐ **Satellite-based Validation (*Ginoux et al., 2012*);**

☐ **Dust Model-based Validation (*Kim et al., 2012*);**

☐ **End User Interactions –**

✓ **Clark County Government, NV;**
✓ **Maricopa Association of Governments, AZ;**
✓ **Bay Area Air Quality Management District, CA;**
✓ **Texas Commission of Environmental Quality;**
✓ **NOAA**
✓ **EPA**