

Extreme Air Pollution Events in Beijing China 2010 & 2013

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Note: In PDF format most of the images in this web paper
can be enlarged for greater detail.

Introduction

The four essays that follow serve to show how confusing it is to understand the state of air quality in China. To start, one must understand that because of the size of modern China, it is inherently difficult to understand the causes of weather experienced in a specific location within China. Beijing, because of a long list of unique characteristics and circumstance, is particularly difficult to understand what causes the weather it experiences on any given day.

But the first problem to address in answering these questions is that we must separate those factors that are under human control from those that are not. Much is already known worldwide about how to keep the air clean while producing useable forms of energy such as heat and electricity. Why then does China have such a deadly problem with air pollution? The answer can be found in the decisions made by those people with the authority to decide what forms of raw material and what technologies are used to produce useable forms of energy in China.

Once this reality is recognized then the question of what factors not under human control, that determine where and why air pollution affects some parts of China more than others, can be addressed. Why on average are Baoding, Shijiazhuang, and Handan more affected by air pollution than Beijing? And why, again on average, is Beijing more affected than Shanghai or Shizuishan?

Geomorphology, the study of the geology and topography of the shape of the land, and meteorology, the study of weather systems that pass over the land, are the two primary non-human factors that influence where aerosols go. An aerosol is a suspension of fine solid particles or liquid droplets in a gas, such as fresh air we can breathe. Examples of aerosols are clouds, and air pollution such as smog and smoke. Therefore aerosols are by definition airborne. They ride on the wind or hang in the air above us. And it is the wind moving over or around the landforms of China that determines where air pollution ends up going, once it has been produced.

Once it is understood that it is the winds blowing over or around the shape of the land, or landforms, that determines where air pollution concentrates, then it becomes clear that some areas will be free of air pollution, while in others air pollution will be concentrated. This set of four essays is concerned with the places where air pollution is concentrated to extremes.

Web Reference

<http://fire.biol.wvu.edu/trent/alles/AirPollution.pdf>

Extreme Air Pollution Event in Beijing China

January 19, 2010

Introduction

On the 18th, 19th, and 20th of January 2010, Beijing experienced an extreme air pollution event that lasted:

7 hours on the 18th, 8 hours on the 19th, and 3 hours on the 20th

for a total of 18 hours with an AQI at 500 or Beyond Index over three days.

In addition, countrywide:

On the 18th: 37% of the 86 reporting cities had a PM10 API over 100.

On the 19th: 42% of the 86 reporting cities had a PM10 API over 100.

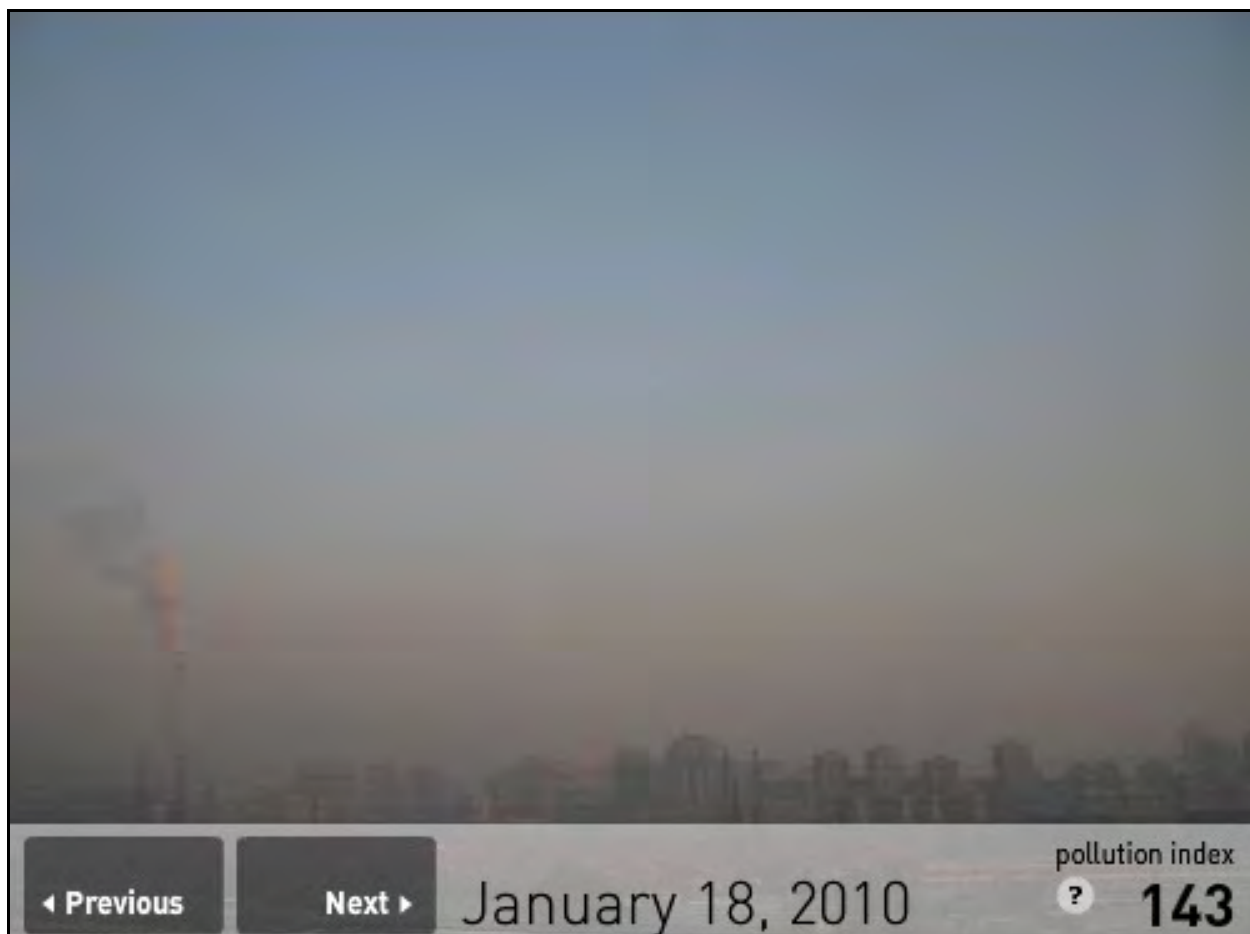
On the 20th: 38% of the 86 reporting cities had a PM10 API over 100.

What follows is a detailed account of the event.

MEP Air Pollution Index Grades (Levels) for PM10

API	Grade	Air quality description
0-50	Grade 1	Excellent
51-100	Grade 2	Good
101-150	Grade 3A	Slightly polluted
151-200	Grade 3B	Light polluted
201-250	Grade 4A	Moderate polluted
251-300	Grade 4B	Moderate-heavy polluted
>300	Grade 5	Heavy polluted
500	Grade 5 top of the Index	

Note: All air pollution readings shown are based on the systems of reporting, such as above, that were in use at the time of the event.



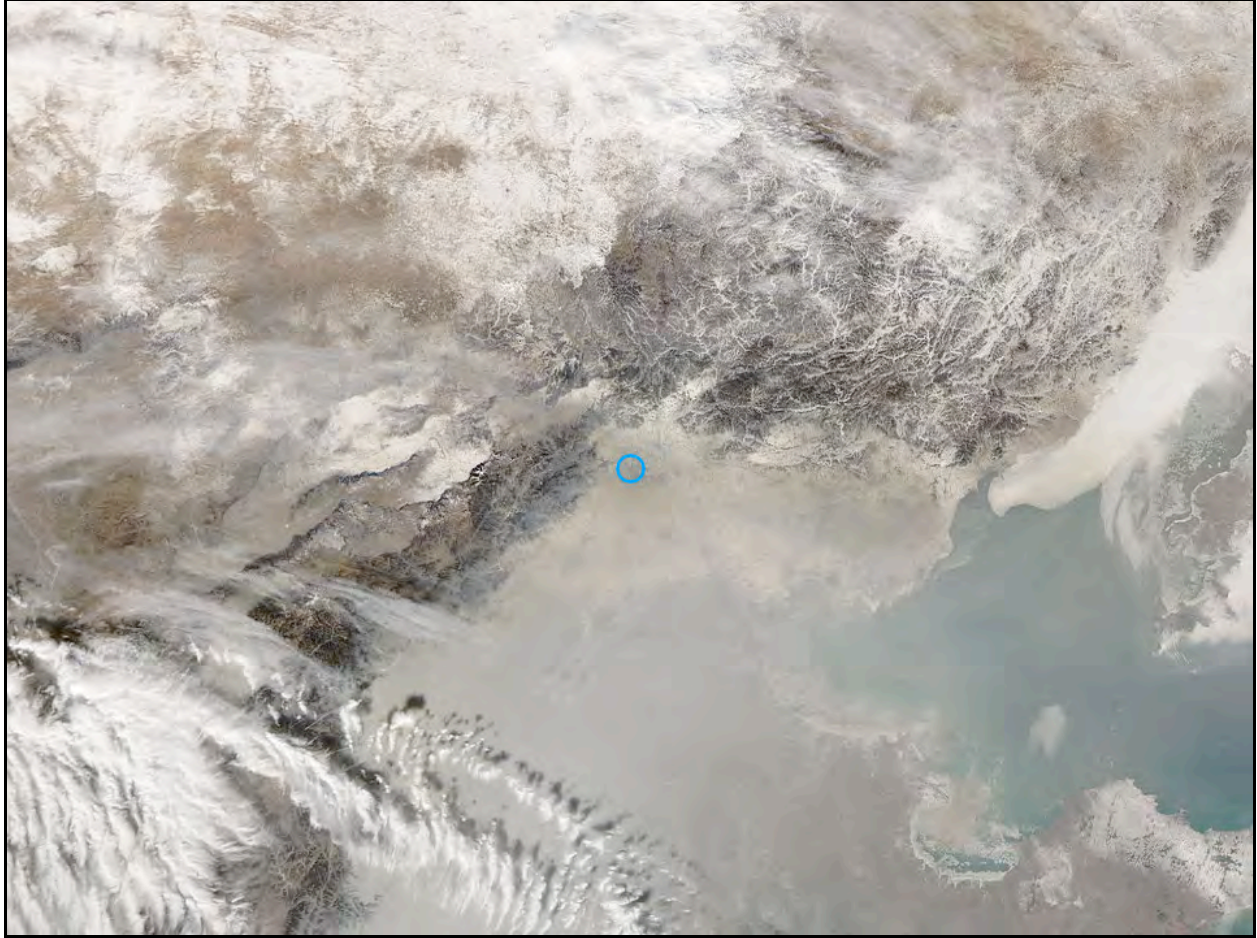
Beijing (pictured above) courtesy of the Asia Society's *Room with a View*

- **API & AQI Readings for Beijing**

1-18-10 = 143 avg. API PM10; PM 2.5 = 319 to 435 conc.; for 7hrs at 500 AQI.

- **2010-1-18 PM10 for Selected Cities:** Tianjin = 170, Taiyuan = 158, Datong = 133, Hohhot = 116, **Chifeng = 343**, Shenyang = 102, Harbin = 108, **Shanghai = 44**, Hangzhou = 100, Weifang = 122, Zaozhuang = 120, Hefei = 127, Wuhan = 106, Chengdu = 146, Chongqing = 136, Pingdingshan = 101, Zhengzhou = 133, Weinan = 167, Xi'an = 122, Yinchuan = 138, Shizuishan = 124.

- **Countrywide Readings:** 26-Grade 3As, 5-3Bs, 1-5 = **32 of 86 or 37%** of the reporting cities had a PM10 API over 100.



Beijing (centered on the blue circle) on January 18, 2010 as seen in this NASA AERONET image taken from the Terra satellite at 1120-CST.

NASA Rapid Response - Subset AERONET Beijing
<http://lance-modis.eosdis.nasa.gov/imagery/subsets/?project=aeronet&subset=Beijing>



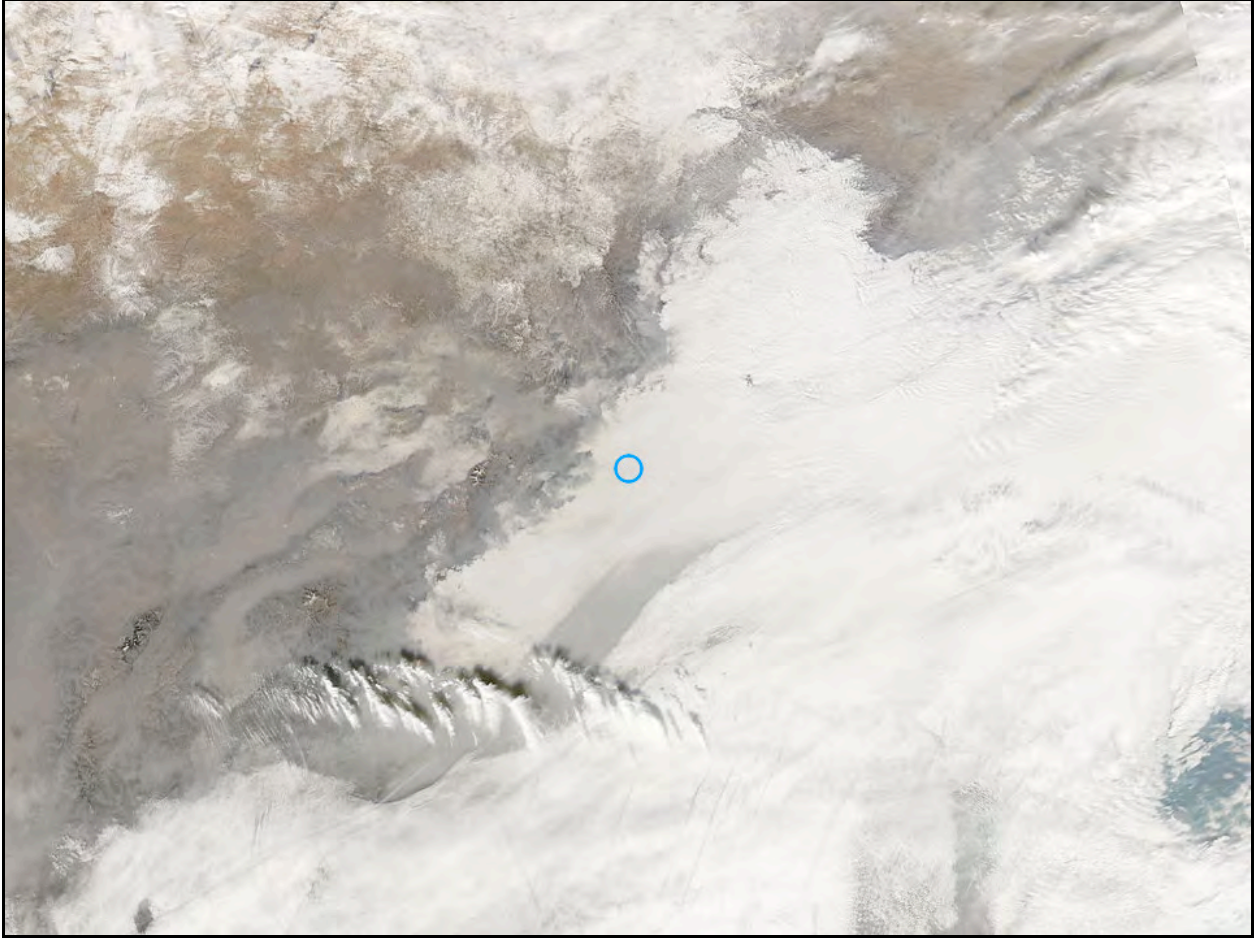
Beijing picture courtesy of the Asia Society's *Room with a View*

• **API & AQI Readings for Beijing**

1. PM10 24Hr. average reading was **183**; 2. PM2.5, 24Hr. Avg. = **481 AQI**;
3. Highest Reading was **485 conc.**; **500 AQI**; 4. Longest period at or above 500 was a continuous period of **8 hrs at 500 AQI**.

• **2010-1-19 PM10 for Selected Cities:** Tianjin = 176, Shijiazhuang = 104, Taiyuan = 123, Datong = 168, Hohhot = 119, Chifeng = 134, Qinhuangdao = 105, Shenyang = 106, Harbin = 112, Jinan = 163, Zibo = 114, Yantai = 64, Rizhao = 41, Lianyungang = 56, **Shanghai = 40**, Hangzhou = 119, Ningbo = 67, Guangzhou = 111, Jining = 109, Zaozhuang = 123, Hefei = 119, Wuhan = 111, Chengdu = 156, Chongqing = 135, Kaifeng = 116, Pingdingshan = 106, Zhengzhou = 150, Weinan = 192, Xi'an = 123, Yinchuan = 155, Shizuishan = 145.

• **Countrywide PM10 Readings:** 28-Grade 3As, 8-3Bs: = **36 of 86 or 42%** of the reporting cities had a PM10 API over 100.



Beijing (centered on the blue circle) on January 19, 2010 as seen in this NASA AERONET image taken from the Aqua satellite at 1345-CST.



Beijing picture courtesy of the Asia Society's *Room with a View*

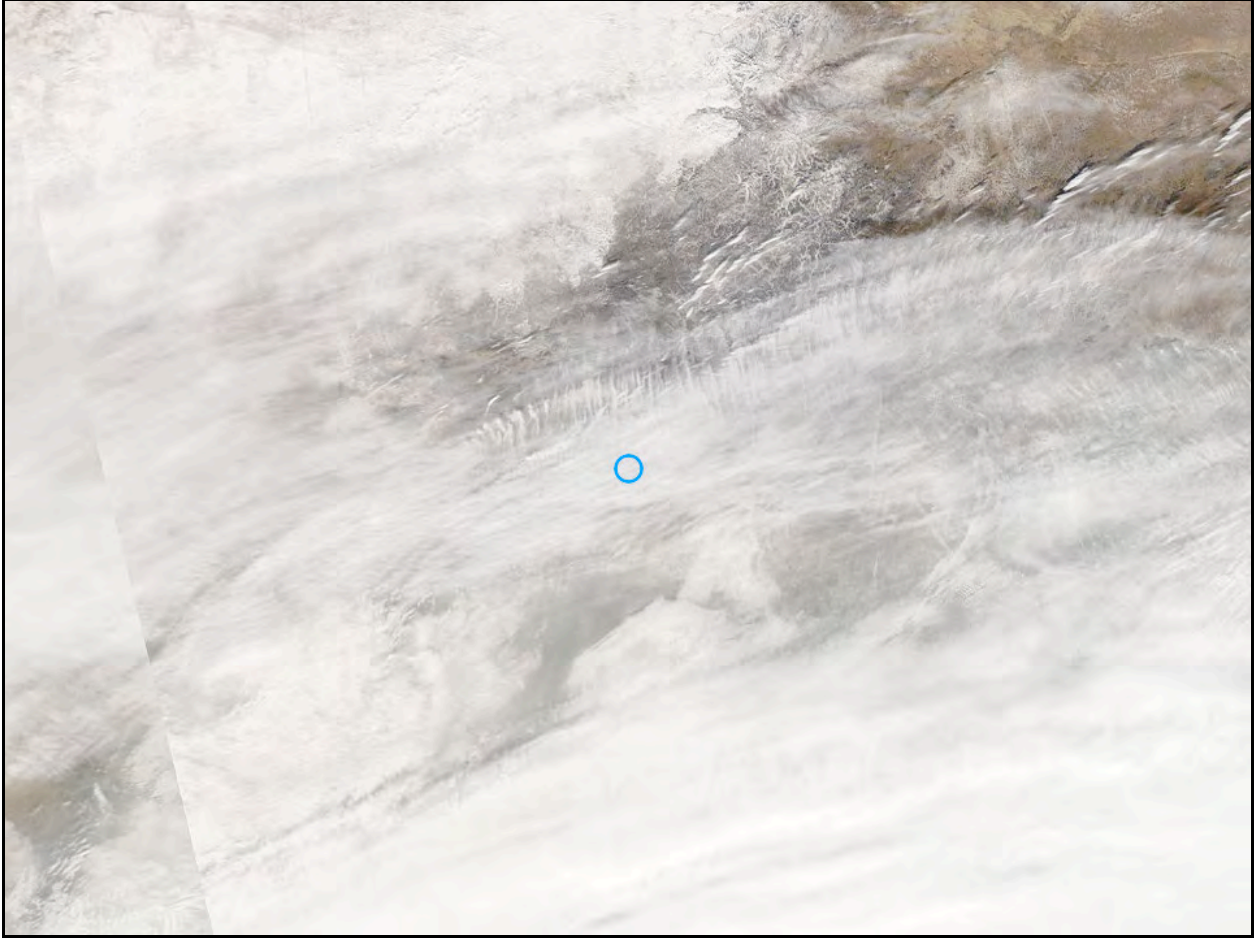
- **API & AQI Readings for Beijing**

1-20-10 = 140 avg. API; PM 2.5 = 166 to 389 conc.; 3hrs at 500 AQI.

- **2010-1-19 PM10 for Selected Cities:** Tianjin = 134, Shijiazhuang = 108.

Yangquan = 119, Taiyuan = 138, Jinan = 159, Zibo = 129, Yantai = 42, Rizhao = 61, Lianyungang = 67, **Shanghai = 46**, Hangzhou = 112, Guangzhou = 99, Tai'an = 119, Jining = 139, Zaozhuang = 137, Hefei = 99, Wuhan = 123, Chengdu = 175, Chongqing = 116, Pingdingshan = 185, Kaifeng = 108, Zhengzhou = 184, Weinan = 196, Xi'an = 128, Baoji = 137, Yinchuan = 133, Shizuishan = 140,

- **Countrywide PM10 Readings:** 27-Grade 3As, 6-3Bs: = **33 of 86 or 38%** of the reporting cities had a PM10 API over 100.



Beijing (centered on the blue circle) on January 20, 2010 as seen in this NASA AERONET image taken from the Aqua satellite at 1250-CST.

LONGING FOR BLUE SKIES ROOM WITH A VIEW STATISTICALLY SPEAKING NEWS FEED

Longing for Blue Skies

向往蓝天

Air pollution is an unfortunate consequence of China's recent rapid development.


The 2008 Olympics are focusing global attention on Beijing's air quality.

Despite government efforts to control the problem, it remains a serious challenge for both China and the world.



LONGING FOR BLUE SKIES ROOM WITH A VIEW STATISTICALLY SPEAKING NEWS FEED

A photo diary of Beijing's Air



◀ Previous Next ▶ March 29, 2011 pollution index ? **86**

◀ **March 2011** ▶
78.3 avg pollution, 23 blue sky days

		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31		

- ▶ Best air quality
- ▶ Worst air quality
- ▶ Greatest daily change

This was the last day for this site before the Chinese government shut it down.

However the link to the site remains: <http://sites.asiasociety.org/beijingair/>

2010-1-16 to 2010-1-23 records of Daily Average PM10 & PM2.5 readings for **Beijing** and example cities with a PM10 reading over 100 for the day.

2010-1-16 = **85API** (PM2.5 **228/341AQI**), Tianjin = 101, Taiyuan = 121, Datong = 121,
(23) Hohhot = 106, Shenyang = 175, Fushun = 132, Jinan = 120, Zibo = 108,
Shanghai = 74, Hangzhou = 105, Guangzhou = 110, Chengdu = 136,
Chongqing = 110, Pingdingshan = 101, Xi'an = 106, Shizuishan = 108.
(20-Grade 3As, 3-3Bs: = **23** (27%) of 86 reporting cities had an API over 100.)

2010-1-17 = **124API** (PM2.5 **259/433AQI**), Tianjin = 104, Taiyuan = 150, Datong = 159,
(29) Hohhot = 110, Shenyang = 105, Chifeng = 193, Harbin = 143, Zibo = 104,
Shanghai = 51, Hangzhou = 107, Ningbo = 105, Wuhan = 103, Chengdu = 146,
Chongqing = 128, Zhengzhou = 102, Weinan = 147, Xi'an = 128, Yinchuan = 121,
Shizuishan = 112, (25-Grade 3As, 3-3Bs, 1-4A = **29** (34%))

2010-1-18 = 143API (PM2.5 **319 to 435conc.**; **7hrs 500AQI**) Tianjin = 170, Taiyuan = 158
(32) Datong = 133, (32) Hohhot = 116, **Chifeng = 343 PM10**, Shenyang = 102,
Harbin = 108, **Shanghai = 44**, Hangzhou = 100, Weifang = 122,
Zaozhuang = 120, Hefei = 127, Wuhan = 106, Chengdu = 146, Chongqing = 136,
Pingdingshan = 101, Zhengzhou = 133, Weinan = 167, Xi'an = 122,
Yinchuan = 138, Shizuishan = 124 (26-Grade 3As, 5-3Bs, 1-5: = **32** (37%))

***1-19-10 = 183API** (PM2.5 **481 to 485conc.**; **8hrs 500AQI**) Tianjin = 176,
(36) Shijiazhuang = 104, Taiyuan = 123, Datong = 168, Hohhot = 119, Chifeng = 134,
Qinhuangdao = 105, Shenyang = 106, Harbin = 112, Jinan = 163, Zibo = 114,
Yantai = 64, Rizhao = 41, Lianyungang = 56, **Shanghai = 40**, Hangzhou = 119,
Ningbo = 67, Guangzhou = 111, Jining = 109, Zaozhuang = 123, Hefei = 119,
Wuhan = 111, Chengdu = 156, Chongqing = 135, Pingdingshan = 106,
Kaifeng = 116, Zhengzhou = 150, Weinan = 192, Xi'an = 123, Yinchuan = 155,
Shizuishan = 145 (28-Grade 3As, 8-3Bs: = **36** (42%))

1-20-10 = 140 (166 to **389conc.**; **3hrs at 500AQI**), Tianjin = 134, Shijiazhuang = 108,
(33) Yangquan = 119, Taiyuan = 138, Jinan = 159, Zibo = 129, Yantai = 42,
Rizhao = 61, Lianyungang = 67, **Shanghai = 46**, Hangzhou = 112,
Guangzhou = 99, Tai'an = 119, Jining = 139, Zaozhuang = 137, Hefei = 99,
Wuhan = 123, Chengdu = 175, Chongqing = 116, Pingdingshan = 185,
Kaifeng = 108, Zhengzhou = 184, Weinan = 196, Xi'an = 128, Baoji = 137,
Yinchuan = 133, Shizuishan = 140 (27-Grade 3As, 6-3Bs: = **33** (38%))

1-21-10 = **24API** (**79/159AQI**), Shanghai = 82, Guangzhou = 124, (**1-Grade 3A**)

1-22-10 = **57API** (**84/134AQI**), Shanghai = 47, Guangzhou = 65, Chengdu = 95, (**2-3As**)

Beijing China Extreme Aerosol Event on 2010-2-13 & 2-14

Introduction

During the late night hours of February 13, 2010 and early hours of the 14th an extraordinary event occurred in Beijing's skies. From 10:30 pm CST the 13th to until 3:30 pm CST the 14th, an elapsed time of 6 hours, a hazardous blanket of smog built up over Beijing that may be the densest on record. A PM 2.5 reading of **particulate matter of 980.0 concentration with an AQI of 817** filled the sky over central Beijing.

(Please note that this reading is much higher than the Saturday, January 12, 2013, at 8:00 PM CST Beijing's air quality reading that was 886 conc; 755 AQI.)

On the following page are the United States Embassy in Beijing records from 02-13-2010; 18:00 to 02-14-2010; 05:00 for PM2.5 taken on the embassy grounds during that period. (Note the records read from bottom to top.)

On the page following the Embassy's PM2.5 records are Weather Underground's atmospheric records for Beijing from 2010-2-13-CST PM to 2010-2-14-CST AM. The red boxes mark the correlations with the PM2.5 readings. All times used are China Standard Time. (These records read from top to bottom.)

Note that at 1:00 AM the temperature was 19.4 degrees Fahrenheit and visibility 1.9 miles, with variable winds at 2.2 mph—ideal conditions for a temperature inversion.

Web Reference for Temperature Inversion

<http://www.wrh.noaa.gov/slc/climate/TemperatureInversions.php>

02-14-2010; 05:00; PM2.5; 7.0; 23; Good // Ozone; 14.2; 12; Good

1:12 PM Feb 13th from API

02-14-2010; 04:00; PM2.5; 39.0; 107; Unhealthy for Sensitive Groups // Ozone; 7.9; 7; Good

12:12 PM Feb 13th from API

02-14-2010; 03:00; PM2.5; 599.0; 565; Hazardous // Ozone; 3.6; 3; Good

11:12 AM Feb 13th from API

02-14-2010; 02:00; PM2.5; no data // Ozone; 6.1; 5; Good

10:12 AM Feb 13th from API

02-14-2010; 01:00; PM2.5; 980.0; 817; Hazardous // Ozone; 7.9; 7; Good

9:12 AM Feb 13th from API

↑
AQI

02-14-2010; 00:15; Past 24hr: PM2.5 avg; 88.2; 164; Unhealthy//Ozone 8hr high; 21.3; 18; Good

8:15 AM Feb 13th from API

02-14-2010; 00:00; PM2.5; 351.0; 401; Hazardous // Ozone; 10.1; 8; Good

8:12 AM Feb 13th from API

02-13-2010; 23:00; PM2.5; 267.0; 317; Hazardous // Ozone; 12.8; 11; Good

7:12 AM Feb 13th from API

02-13-2010; 22:00; PM2.5; 259.0; 309; Hazardous // Ozone; 14.9; 13; Good

6:12 AM Feb 13th from API

02-13-2010; 21:00; PM2.5; 213.0; 263; Very Unhealthy // Ozone; 16.9; 14; Good

5:12 AM Feb 13th from API

02-13-2010; 20:00; PM2.5; 136.0; 192; Unhealthy // Ozone; 19.0; 16; Good

4:12 AM Feb 13th from API

02-13-2010; 19:00; PM2.5; 113.0; 178; Unhealthy // Ozone; 20.9; 18; Good

3:12 AM Feb 13th from API

02-13-2010; 18:00; PM2.5; 100.0; 171; Unhealthy // Ozone; 21.3; 18; Good

2:12 AM Feb 13th from API

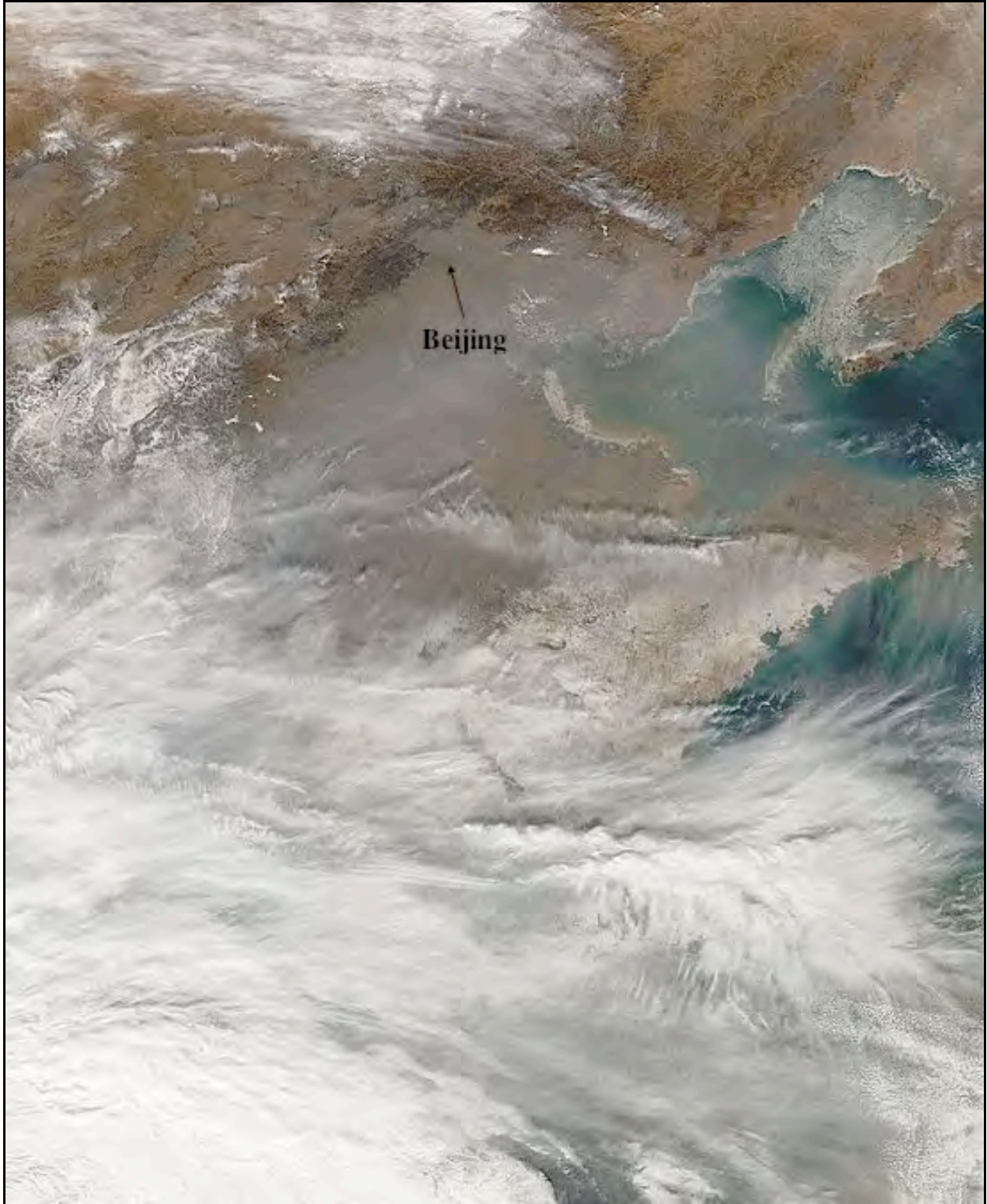
China CST
AM/PM

7:00 PM	30.2 °F	5.0 °F	34%	30.33 in	-	South	6.7 mph	-	N/A	Clear	
7:30 PM	30.2 °F	5.0 °F	34%	30.33 in	5.0 miles	South	6.7 mph	-	N/A	Clear	
8:00 PM	32.0 °F	5.0 °F	32%	30.33 in	5.0 miles	SSW	8.9 mph	-	N/A	Clear	
8:30 PM	30.2 °F	5.0 °F	34%	30.33 in	4.3 miles	SSW	4.5 mph	-	N/A	Clear	
9:00 PM	24.8 °F	5.0 °F	43%	30.33 in	3.7 miles	Variable	2.2 mph	-	N/A	Clear	
9:30 PM	23.0 °F	6.8 °F	50%	30.33 in	3.7 miles	Calm	Calm	-	N/A	Clear	
10:00 PM	23.0 °F	8.6 °F	54%	30.36 in	3.7 miles	Variable	2.2 mph	-	N/A	Clear	
10:30 PM	23.0 °F	8.6 °F	54%	30.36 in	3.1 miles	Calm	Calm	-	N/A	Smoke	
11:00 PM	28 °F	6 °F	25%	30.35 in	9 miles	SW	4.5 mph	-	-		
11:00 PM	21.2 °F	8.6 °F	58%	30.36 in	3.1 miles	Variable	2.2 mph	-	N/A	Smoke	
11:30 PM	19.4 °F	6.8 °F	58%	30.36 in	3.1 miles	Variable	2.2 mph	-	N/A	Smoke	
Time (CST):	Temp.:	Dew Point:	Humidity:	Sea Level Pressure:	Visibility:	Wind Dir:	Wind Speed:	Gust Speed:	Precip:	Events:	Conditions:
12:00 AM	19.4 °F	8.6 °F	63%	30.36 in	3.1 miles	ENE	2.2 mph	-	N/A	Smoke	
12:30 AM	21.2 °F	8.6 °F	58%	30.36 in	2.5 miles	North	2.2 mph	-	N/A	Smoke	
1:00 AM	19.4 °F	6.8 °F	58%	30.39 in	1.9 miles	Variable	2.2 mph	-	N/A	Smoke	
1:30 AM	21.2 °F	6.8 °F	54%	30.39 in	1.9 miles	NNW	4.5 mph	-	N/A	Smoke	
2:00 AM	24 °F	8 °F	35%	30.39 in	5 miles	NNW	2.2 mph	-	-	Smoke	
2:00 AM	23.0 °F	6.8 °F	50%	30.39 in	1.9 miles	NNW	6.7 mph	-	N/A	Smoke	
2:30 AM	23.0 °F	6.8 °F	50%	30.42 in	1.9 miles	NNW	8.9 mph	-	N/A	Smoke	
3:00 AM	21.2 °F	6.8 °F	54%	30.42 in	2.5 miles	North	6.7 mph	-	N/A	Smoke	
3:30 AM	19.4 °F	6.8 °F	58%	30.42 in	2.5 miles	North	6.7 mph	-	N/A	Smoke	
4:00 AM	23.0 °F	6.8 °F	50%	30.42 in	3.7 miles	North	8.9 mph	-	N/A	Clear	
4:30 AM	23.0 °F	6.8 °F	50%	30.42 in	3.7 miles	North	4.5 mph	-	N/A	Clear	
5:00 AM	30 °F	-5 °F	10%	30.42 in	19 miles	North	13.4 mph	-	-	Clear	
5:00 AM	26.6 °F	1.4 °F	34%	30.42 in	-	NNW	11.2 mph	-	N/A	Clear	
5:30 AM	28.4 °F	-2.2 °F	27%	30.45 in	-	North	15.7 mph	-	N/A	Clear	

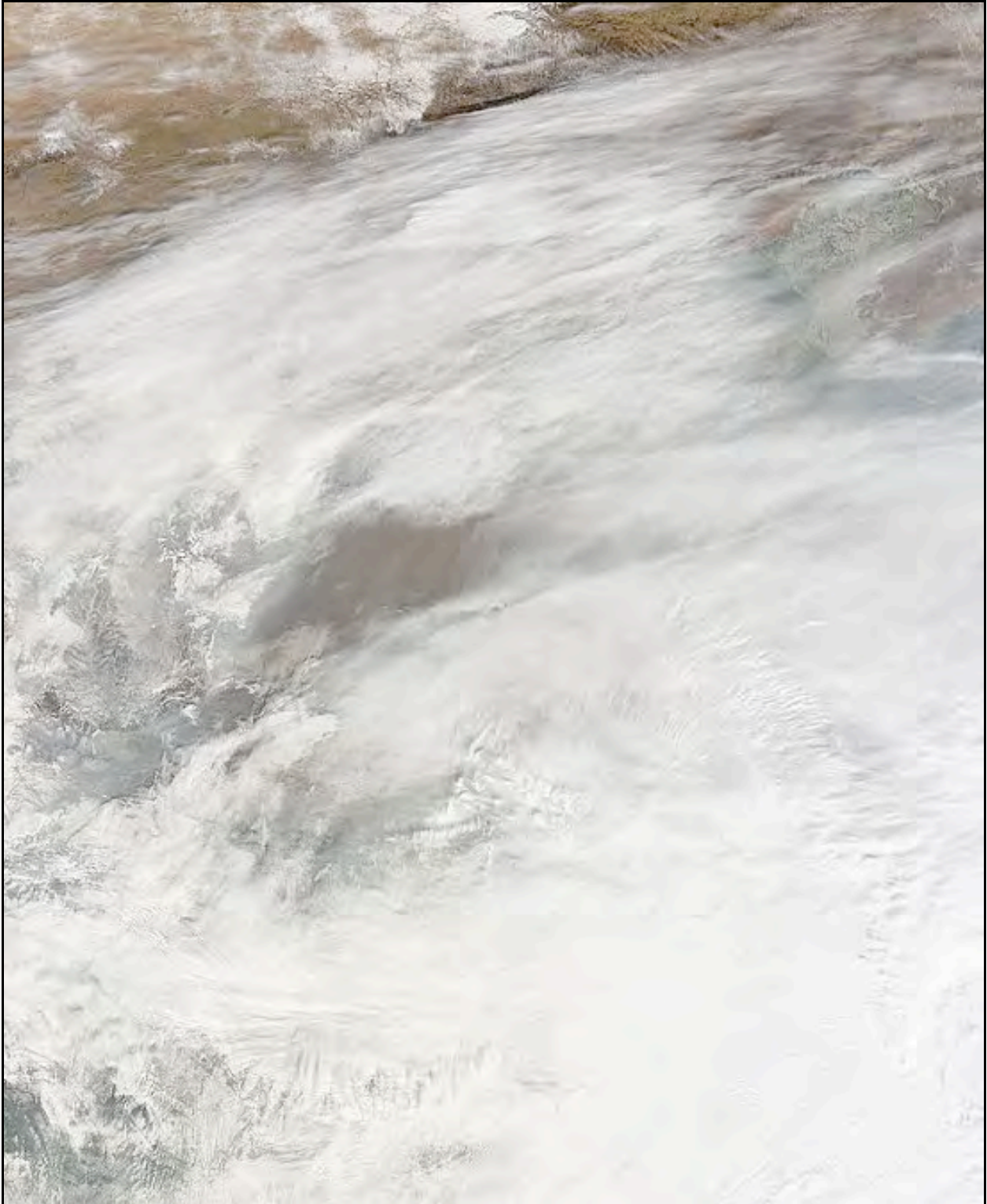
Weather Underground Records for Beijing 7:00 PM 2010-2-13 CST to 5:30 AM 2010-2-14-CST

http://www.wunderground.com/history/airport/ZBAA/2010/2/13/DailyHistory.html?req_city=NA&req_state=NA&req_statename=NA

http://www.wunderground.com/history/airport/ZBAA/2010/2/14/DailyHistory.html?req_city=NA&req_state=NA&req_statename=NA



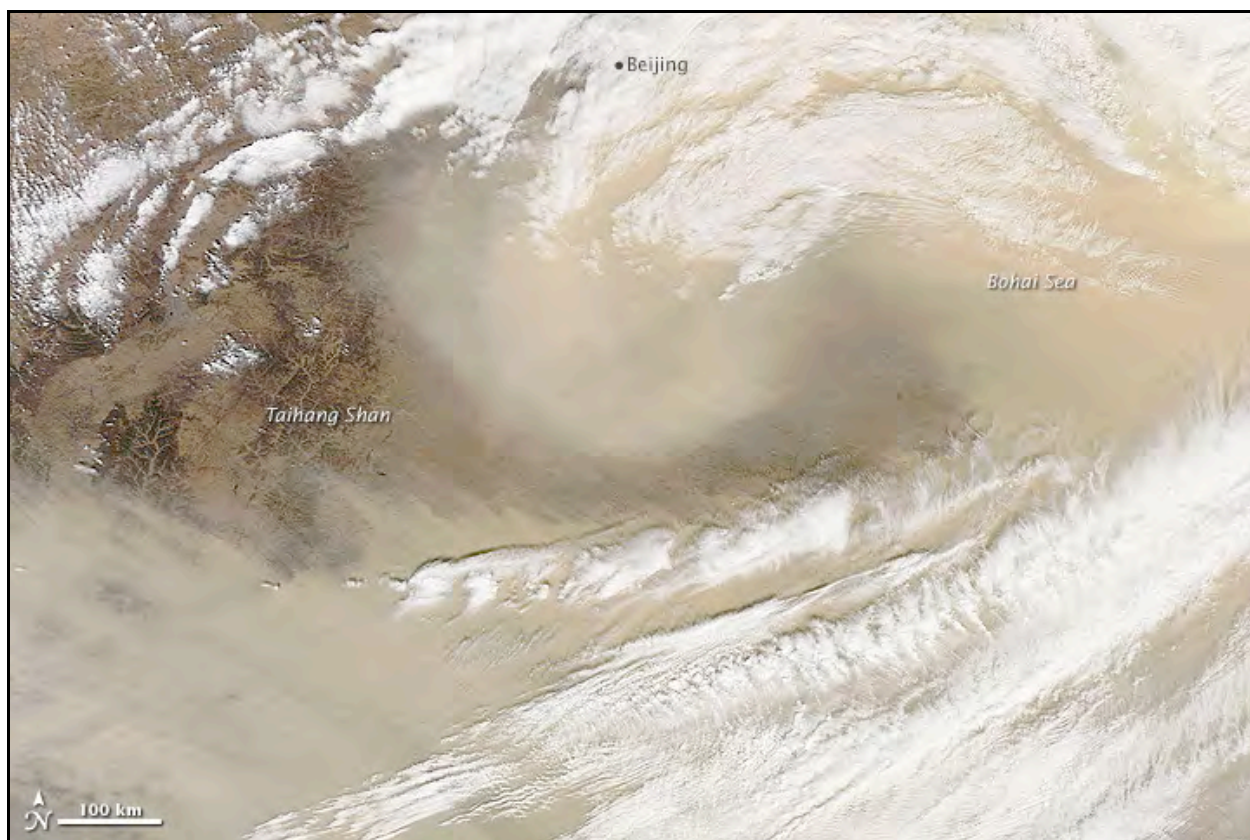
2010-2-13-1340 (1:40 PM) CST-FAS4 Eastern China Aqua 2km



2010-2-14-1100 (11:00 AM) CST-FAS4 Eastern China Terra 2km

**Beijing is covered by clouds but lies in the same
location in this image as in the previous one.**

Spring Sandstorm Scours China on March 20, 2010



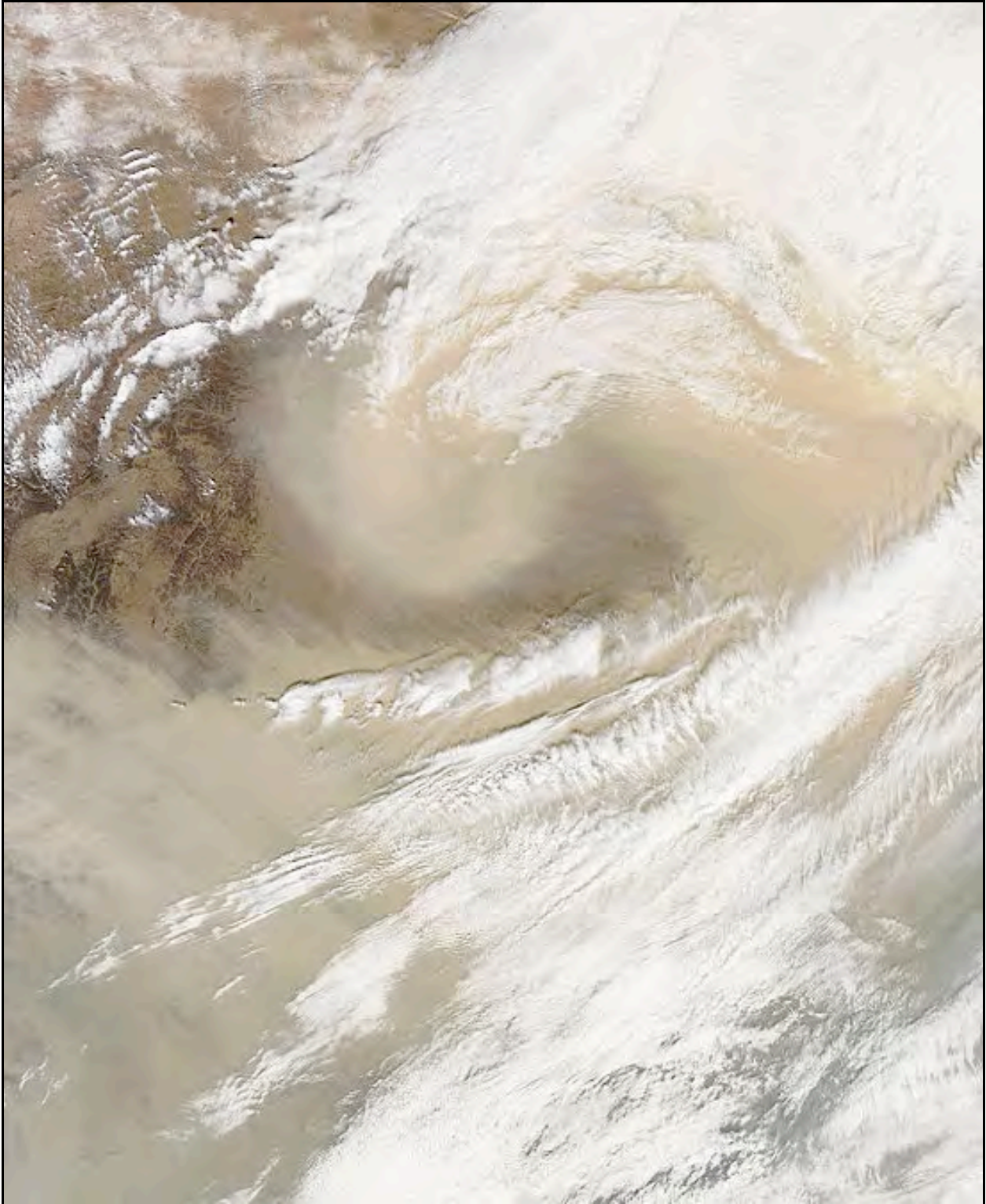
The first day of spring brought a massive sandstorm to China. The sand and dust were swept thousands of kilometers south and east from the arid terrain of Inner Mongolia. The yellow dust reduced visibility and air quality to potentially hazardous levels in the nation's capital Beijing, and as far away as Taiwan and Japan.

This natural-color image from the MODIS instrument on NASA's Terra satellite shows the dust storm on Saturday, March 20, 2010. Few landmarks or topographic features are recognizable beneath the dust, which covers the lower half of the image and wraps around the right-hand side in a comma shape that terminates in a large ball of dust near image center.

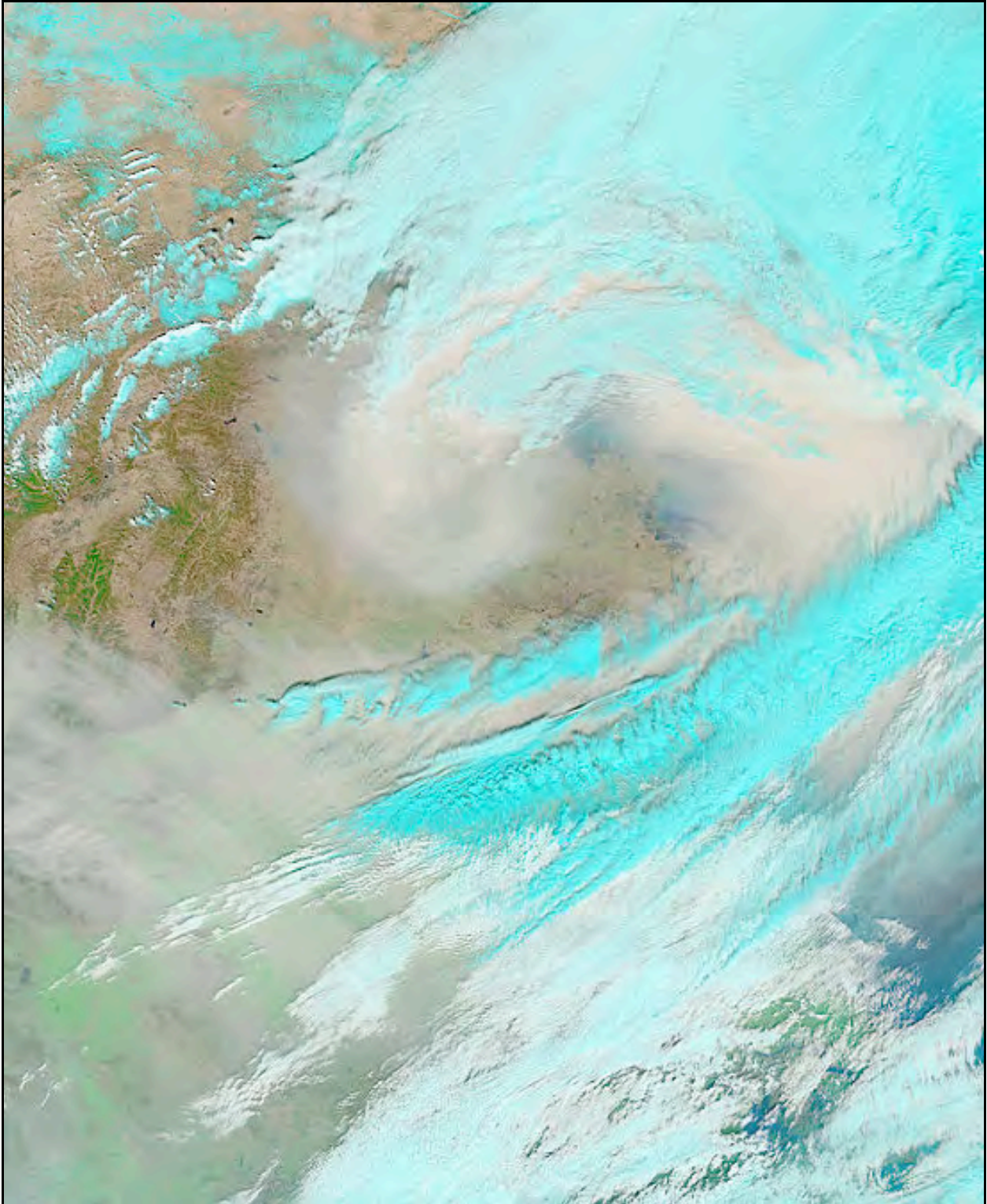
This pattern is consistent with the passing of a cold weather front bearing a strong area of low pressure at the surface. These weather systems, known as mid-latitude or extra tropical cyclones, are often associated with giant comma-shaped clouds that reveal how air from a very wide area gets drawn in toward the low-pressure heart of the storm. The comma shape is more pronounced in the large version of the image.

Web Reference

<http://earthobservatory.nasa.gov/IOTD/view.php?id=43207>



Mid-Latitude Cyclone over Beijing China



2010-3-20 Dust Storm over Beijing shown in Frequency Bands 721

The image reveals the layers of dust (lowest), white clouds with little moisture (middle layer), and moisture laden clouds (top layer).

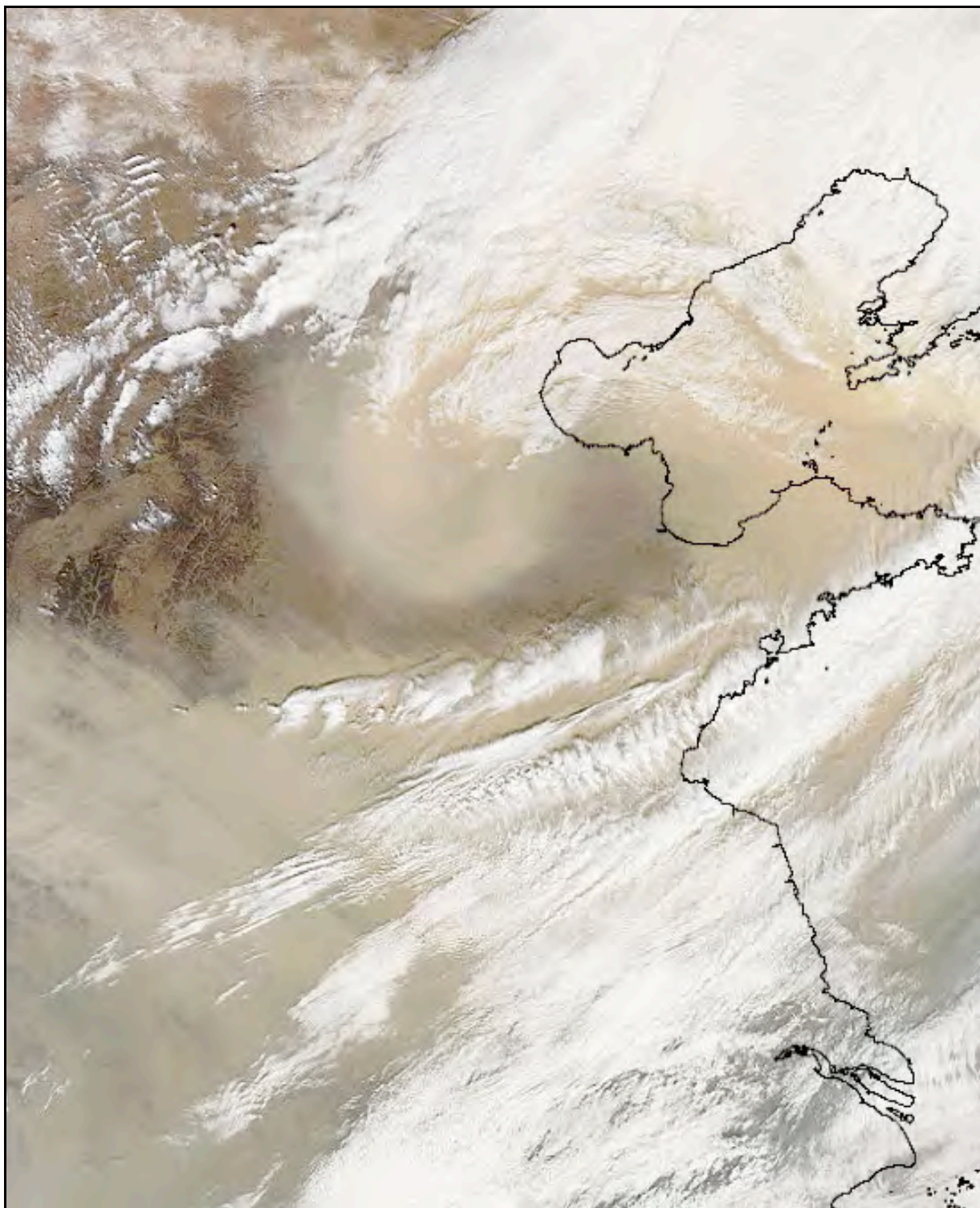


Mid-Latitude Cyclone over the United States

At 3:05 PM Eastern Daylight Time on September 26, 2011, the MODIS instrument on NASA's Aqua satellite observed a mid-latitude cyclone over the Midwestern United States. The center of the storm appeared immediately west of Lake Michigan.

Web Reference

<http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=52297>

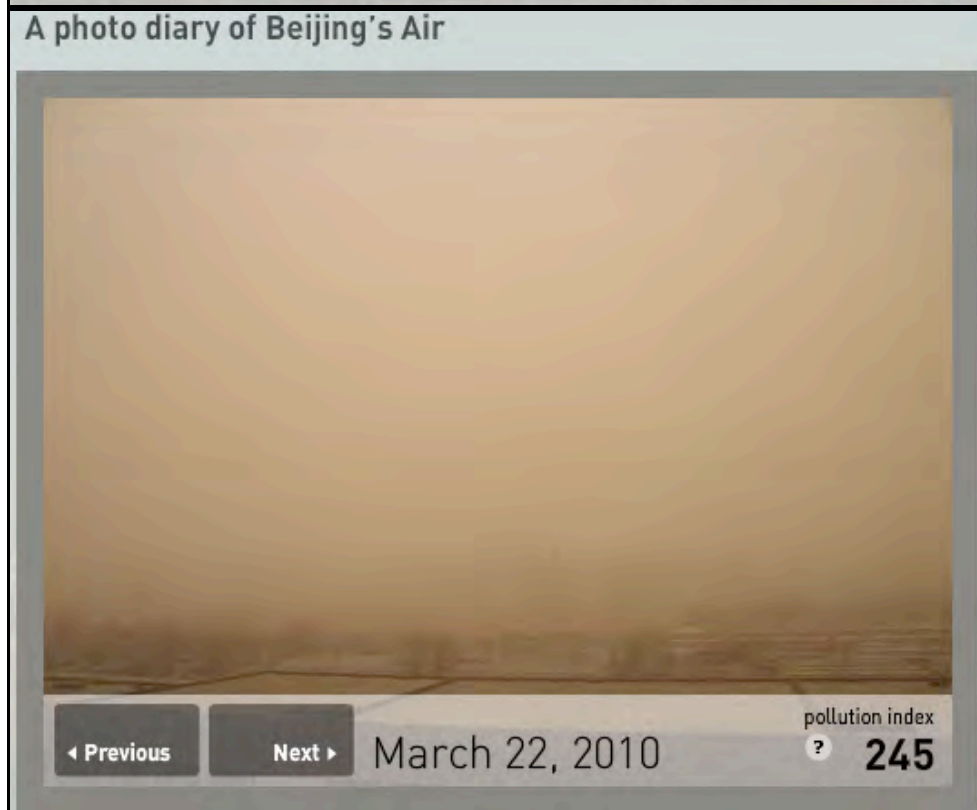


2010-3-20 Dust Storm over Beijing

The coastline of eastern China has been added to show the Bo Sea in the upper right, the Yellow Sea in the lower right, with the mouth of the Yangtze River and Shanghai in the bottom right corner.



Tourists visit Tiananmen Square in Beijing March 20, 2010. A severe sandstorm that plagued northwestern China in the past few weeks arrived in Beijing Friday night, packing strong winds and tons of dust. (Xinhua/Luo Xiaoguang)



These images are from the Asia Society's website "Clearing the Air — Room with a View", which has been blocked since 2011-3-29: <http://sites.asiasociety.org/beijingair/>.

MEP Air Pollution Index Grades (Levels) for PM10

API	Grade	Air quality description
0-50	Grade 1	Excellent
51-100	Grade 2	Good
101-150	Grade 3A	Slightly polluted
151-200	Grade 3B	Light polluted
201-250	Grade 4A	Moderate polluted
251-300	Grade 4B	Moderate-heavy polluted
>300	Grade 5	Heavy polluted
500	Grade 5 top of the Index	

Note that Beijing's March 22nd API was still 245 on a scale that reads to 300 two days after the dust storm of the 20th struck. But also note the smog apparent on March the 19th that produced an API of 145.

2010-03-20		
City Name	API	Grade
Beijing	500	5
Tianjin	179	3B
Shijiazhuang	137	3A
Qinhuangdao	65	2
Taiyuan	146	3A
Datong	500	5
Yangquan	173	3B
Changzhi	159	3B
Hohhot	500	5

Beijing's API reading March 20, 2010 was 500, the top of the index or above.

The dust storm of March 20, 2010 struck Beijing proper at 6:00 AM when "Widespread Dust" was reported, and the humidity dropped from 81% an hour earlier to 34%, and the wind speed increased to 26.8 mph from Calm 1-1/2 hours before with wind gusts to 42.5 mph by 6:30 AM.

Beijing Environmental Conditions March 20, 2010 from 3:00 AM to 10:00 AM

Time (CST)	Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
3:00 AM	39.2 °F	36.0 °F	37.4 °F	93%	29.56 in	1.4 mi	NNW	4.5 mph	-	N/A		Mist
3:30 AM	39.2 °F	-	37.4 °F	93%	29.53 in	1.4 mi	Variable	2.2 mph	-	N/A		Mist
4:00 AM	42.8 °F	38.7 °F	35.6 °F	76%	29.53 in	1.1 mi	WNW	6.7 mph	-	N/A		Mist
4:30 AM	42.8 °F	-	35.6 °F	76%	29.50 in	0.9 mi	Calm	Calm	-	N/A		Unknown
5:00 AM	41.0 °F	38.1 °F	35.6 °F	81%	29.50 in	0.8 mi	SE	4.5 mph	-	N/A		Unknown
5:30 AM	42.8 °F	-	35.6 °F	76%	29.53 in	0.8 mi	Variable	2.2 mph	-	N/A		Unknown
6:00 AM	48.2 °F	-	21.2 °F	34%	29.56 in	1.1 mi	WNW	26.8 mph	38.0 mph	N/A		Widespread Dust
6:30 AM	48.2 °F	-	24.8 °F	40%	29.56 in	1.2 mi	WNW	29.1 mph	42.5 mph	N/A		Widespread Dust
7:00 AM	44.6 °F	35.6 °F	28.4 °F	53%	29.59 in	2.2 mi	West	24.6 mph	-	N/A		Widespread Dust
7:30 AM	44.6 °F	35.6 °F	23.0 °F	43%	29.59 in	2.2 mi	West	24.6 mph	-	N/A		Widespread Dust
8:00 AM	46 °F	-	21 °F	25%	29.63 in	3 mi	WNW	13.4 mph	-	-		Widespread Dust
8:00 AM	44.6 °F	35.2 °F	23.0 °F	43%	29.62 in	1.9 mi	WNW	26.8 mph	38.0 mph	N/A		Widespread Dust
8:30 AM	44.6 °F	35.2 °F	23.0 °F	43%	29.62 in	1.9 mi	WNW	26.8 mph	-	N/A		Widespread Dust
9:00 AM	44.6 °F	35.6 °F	23.0 °F	43%	29.65 in	1.7 mi	WNW	24.6 mph	35.8 mph	N/A		Widespread Dust
9:30 AM	44.6 °F	37.6 °F	24.8 °F	46%	29.65 in	1.6 mi	WNW	15.7 mph	-	N/A		Widespread Dust
10:00 AM	44.6 °F	35.2 °F	23.0 °F	43%	29.71 in	1.1 mi	NW	26.8 mph	-	N/A		Widespread Dust

Beijing Environmental Conditions March 20, 2010 from 10:30 AM to 5:00 PM

Time (CST)	Temp.	Windchill	Dew Point	Humidity	Pressure	Visibility	Wind Dir	Wind Speed	Gust Speed	Precip	Events	Conditions
10:30 AM	46.4 °F	37.3 °F	21.2 °F	37%	29.74 in	1.1 mi	WNW	29.1 mph	-	N/A		Widespread Dust
11:00 AM	47 °F	-	22 °F	24%	29.75 in	4 mi	NW	17.9 mph	-	-		Blowing Sand
11:00 AM	46.4 °F	38.0 °F	19.4 °F	34%	29.77 in	1.2 mi	NW	24.6 mph	-	N/A		Widespread Dust
11:30 AM	46.4 °F	37.0 °F	14.0 °F	27%	29.80 in	2.2 mi	NW	31.3 mph	42.5 mph	N/A		Widespread Dust
12:00 PM	46.4 °F	36.7 °F	14.0 °F	27%	29.83 in	2.5 mi	NW	33.6 mph	44.7 mph	N/A		Widespread Dust
12:30 PM	44.6 °F	34.5 °F	12.2 °F	27%	29.86 in	3.7 mi	NW	31.3 mph	-	N/A		Widespread Dust
1:00 PM	44.6 °F	34.5 °F	6.8 °F	21%	29.89 in	5.0 mi	NW	31.3 mph	42.5 mph	N/A		Widespread Dust
1:30 PM	46.4 °F	37.7 °F	3.2 °F	17%	29.89 in	5.0 mi	NW	26.8 mph	40.3 mph	N/A		Widespread Dust
2:00 PM	48 °F	-	7 °F	9%	29.88 in	12 mi	NW	11.2 mph	-	-		Scattered Clouds
2:00 PM	50.0 °F	-	-2.2 °F	12%	29.89 in	5.0 mi	NNW	33.6 mph	44.7 mph	N/A		Widespread Dust
2:30 PM	50.0 °F	-	1.4 °F	14%	29.89 in	-	NNW	31.3 mph	-	N/A		Clear
3:00 PM	50.0 °F	-	-0.4 °F	13%	29.89 in	-	NNW	33.6 mph	47.0 mph	N/A		Clear
3:30 PM	50.0 °F	-	1.4 °F	14%	29.89 in	-	NNW	26.8 mph	-	N/A		Clear
4:00 PM	50.0 °F	-	1.4 °F	14%	29.92 in	-	NNW	24.6 mph	35.8 mph	N/A		Clear
4:30 PM	48.2 °F	-	1.4 °F	15%	29.95 in	-	NNW	26.8 mph	38.0 mph	N/A		Clear
5:00 PM	49 °F	-	6 °F	8%	29.96 in	12 mi	NW	15.7 mph	-	-		Clear

By 5:00 PM the dust storm had passed over Beijing but some conditions lingered on. Such as a relative humidity of 8% and northwest winds up to 16.7 mph, and only a half hour earlier a wind gust of 38 mph. But the skies had cleared.

(Environmental Data courtesy of Weather Underground)

"Crazy Bad" Beijing Air Pollution 2013-1-12



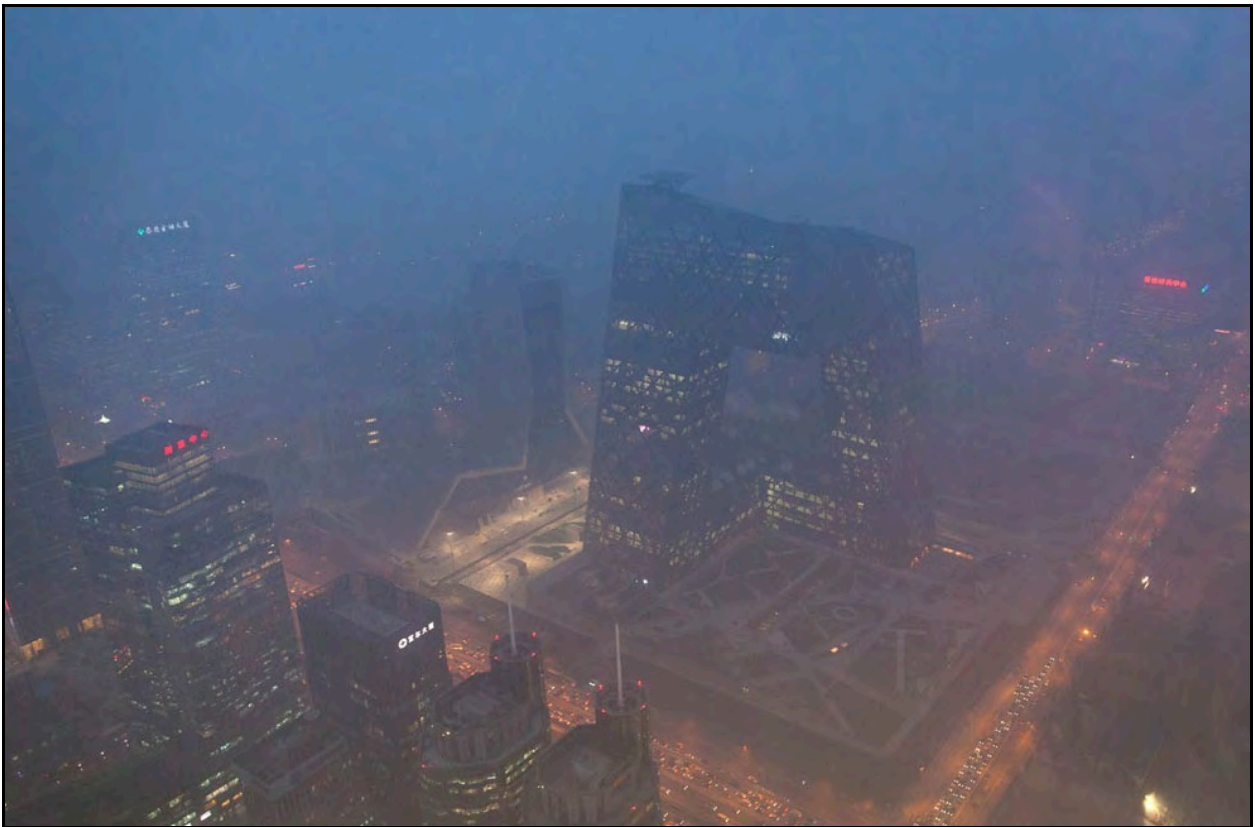
"On Scale of 0 to 500, Beijing's Air Quality tops 'Crazy Bad' at 755"

By Edward Wong, New York Times, Published: January 12, 2013

"Beijing — One Friday more than two years ago, an air-quality monitoring device atop the United States Embassy in Beijing recorded data so horrifying that someone in the embassy called the level of pollution "Crazy Bad" in an infamous Twitter post. That day the Air Quality Index, which uses standards set by the United States Environmental Protection Agency, had crept above 500, which was supposed to be the top of the scale."

"So what phrase is appropriate to describe Saturday's jaw-dropping reading of 755 at 8 p.m. (2000 CST), when all of Beijing looked like an airport smokers' lounge? Though an embassy spokesman said he did not immediately have comparative data, Beijing residents who follow the Twitter feed said the Saturday numbers appeared to be the highest recorded since the embassy began its monitoring system 2008."

On the following two pages are three images of the China Central Television Headquarters in the heart of Beijing. The first image was taken on **February 4, 2012**, the other two on **January 14, 2013**, all by Ed Jones /AFP/Getty Images.





China Central Television Headquarters mid-day January 14, 2013
(Ed Jones /AFP/ Getty Images)

Web Reference

[http://www.militaryphotos.net/forums/showthread.php?221687-Chinese-Daily-Photos-of-2013!!!-\(non-military\)/page3](http://www.militaryphotos.net/forums/showthread.php?221687-Chinese-Daily-Photos-of-2013!!!-(non-military)/page3)



**The Gate of Divine Might
(the northern gate)**

Gate to the Forbidden City on 2013-1-13

(Image by Ng Han Guan/Associated Press)

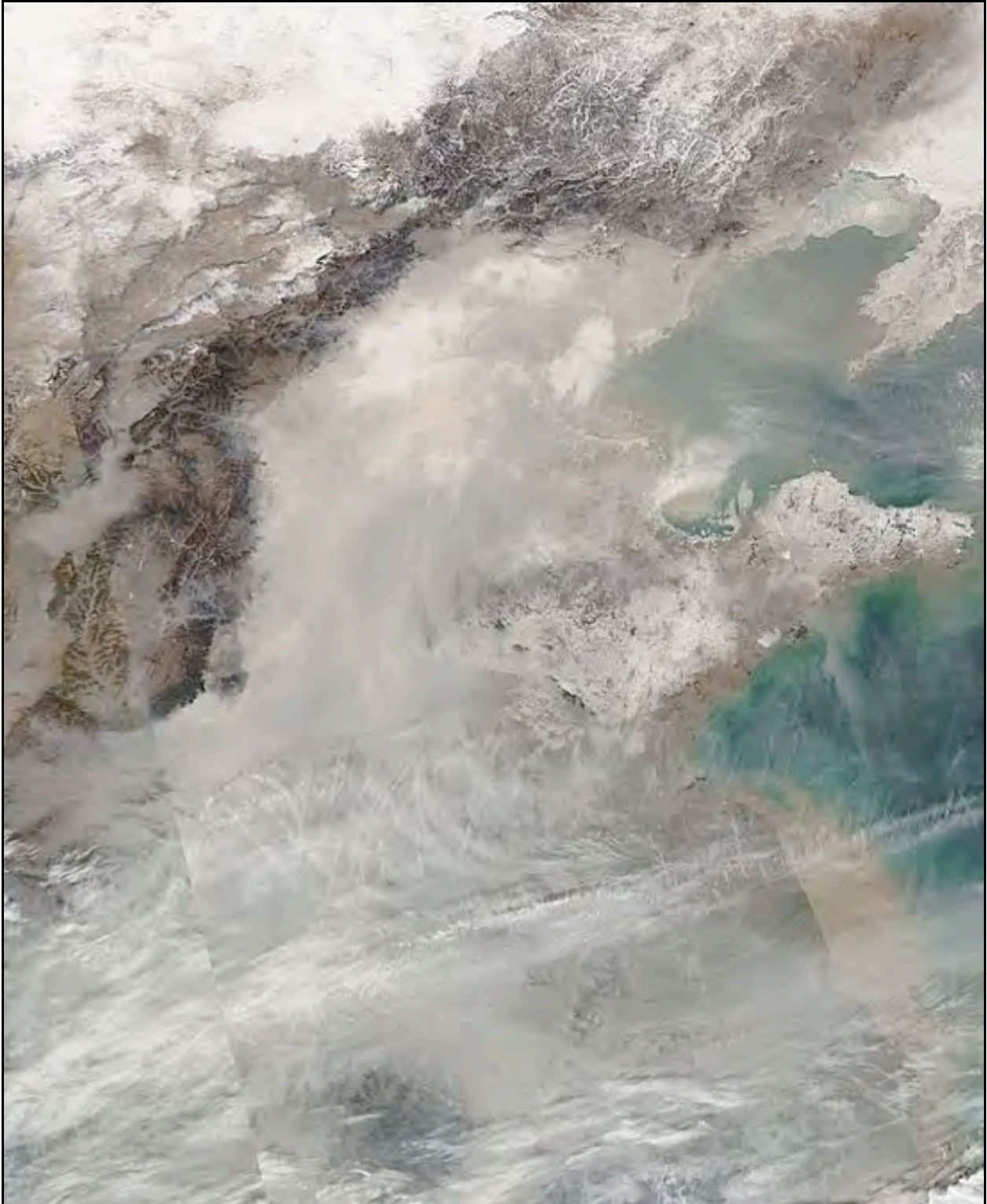
**On Saturday, January 12, 2013, at 8:00 PM (2000 hours) CST,
Beijing's air quality reading was — 886 conc.; 755 AQI.**

U.S. Embassy BeijingAir Twitter Readings 2013-1-1 to 1-24

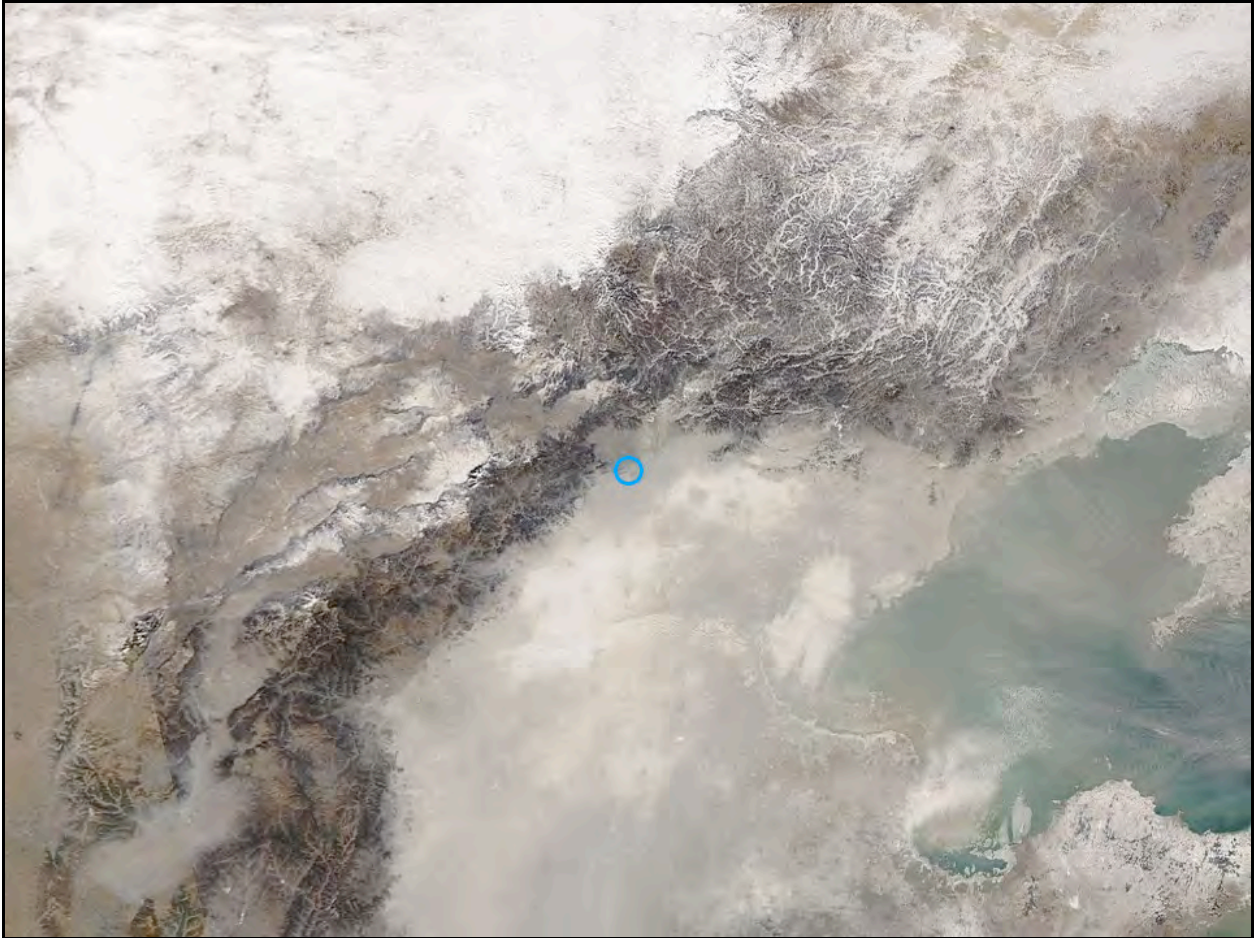
U.S. Embassy BeijingAir Twitter	24 hrs Ave. Readings (in black)
Date Time (CST) Conc.; AQI	Date Time (CST) Conc.; AQI
2013-1-1--1200 — 48; 121	2013-1-12--2000 — 886; 755*
2013-1-2--1200 — 16; 52	2013-1-12--2100 — 852; 732
2013-1-3--1200 — 21; 65	2013-1-12--2200 — 858; 736
2013-1-4--1200 — 38; 104	2013-1-12--2300 — 805; 701
2013-1-5--1200 — 96; 168	2013-1-13--0000 — 744; 661
2013-1-6--1200 — 50; 125	2013-1-13--1200 — 631; 586
2013-1-7--1200 — 175; 225	2013-1-14--1200 — 343; 393
2013-1-8--1200 — 203; 253	2013-1-15--1200 — 157; 208
2013-1-9--1200 — 25; 75	2013-1-16--1200 — 143; 197
2013-1-10--1200 — 136; 191	2013-1-17--1200 — 63; 146
2013-1-11--1200 — 379; 420	2013-1-18--1200 — no record
2013-1-12--1200 — 333; 383	2013-1-19--1200 — 334; 383
2013-1-12--1400 — 529; 519	2013-1-20--1200 — 90; 165
2013-1-12--1500 — 802; 699	2013-1-21--1200 — no record
2013-1-12--1600 — 845; 728	2013-1-22--1200 — no record
2013-1-12--1700 — 810; 704	2013-1-23--1200 — 380; 420
2013-1-12--1800 — 776; 682	2013-1-24--1200 — 180; 230
2013-1-12--1900 — 824; 714	

Web Reference

<https://twitter.com/BeijingAir>

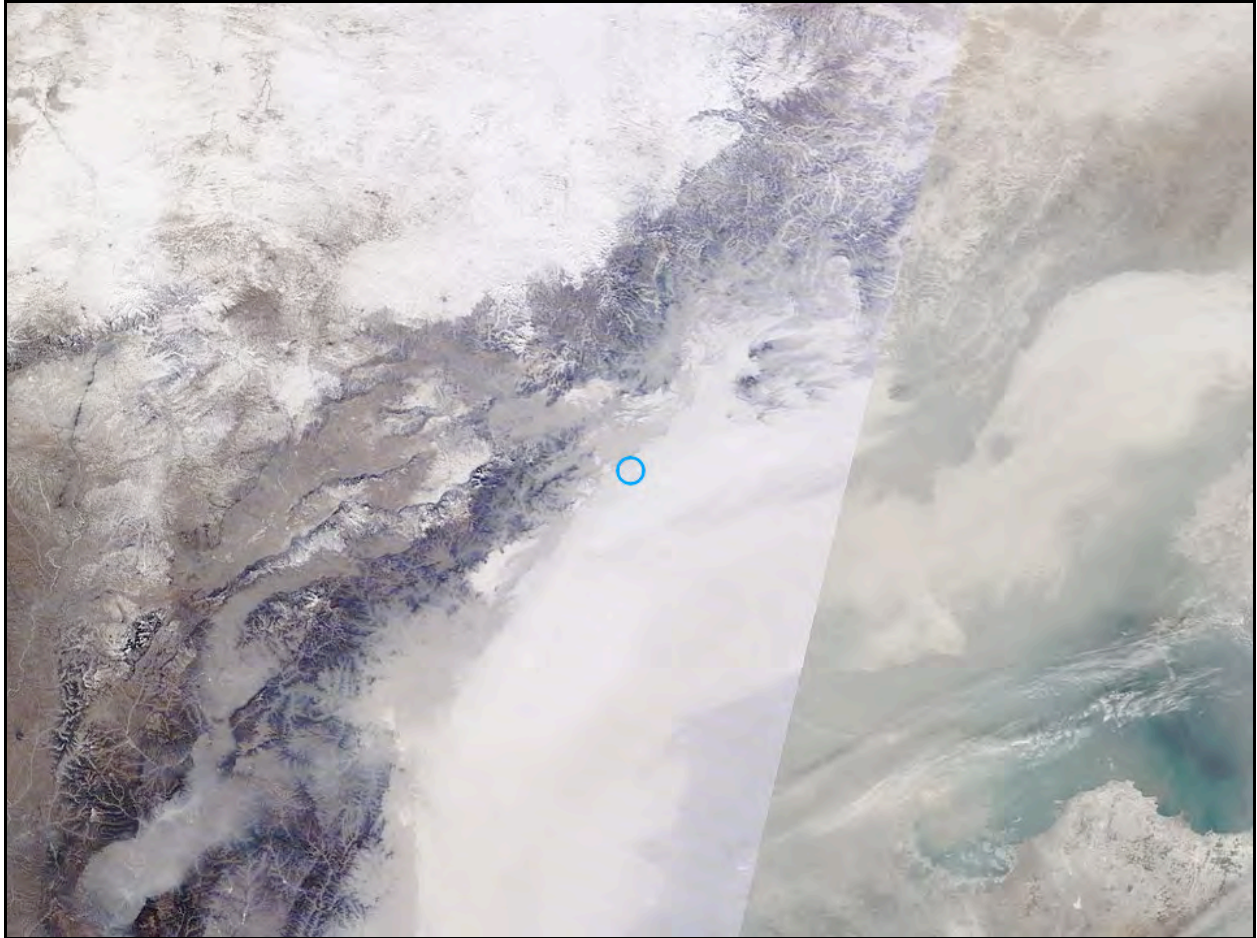


**NASA image 2013-1-12-0450-UTC — 1250 CST, East China, Aqua FAS 2km
Beijing Air Reading 2013-1-12 — 1200 CST: PM 2.5 — 333 conc; 383 AQI**

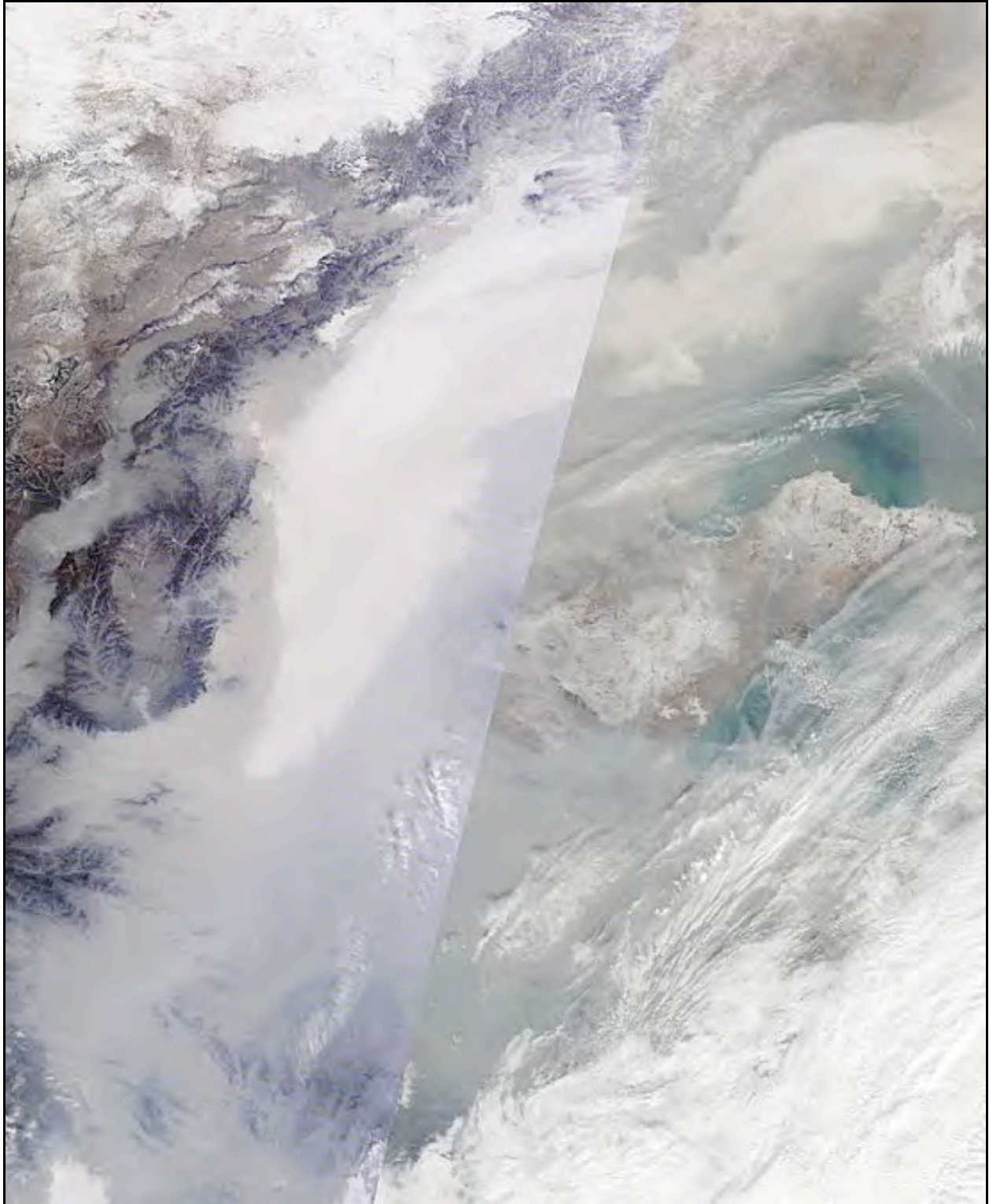


**NASA image 2013-1-12-0450-UTC — 1250 CST, East China, Aqua AERONET 1km
BeijingAir 2013-1-12 — 1200 CST: PM 2.5 — 333 conc; 383 AQI**

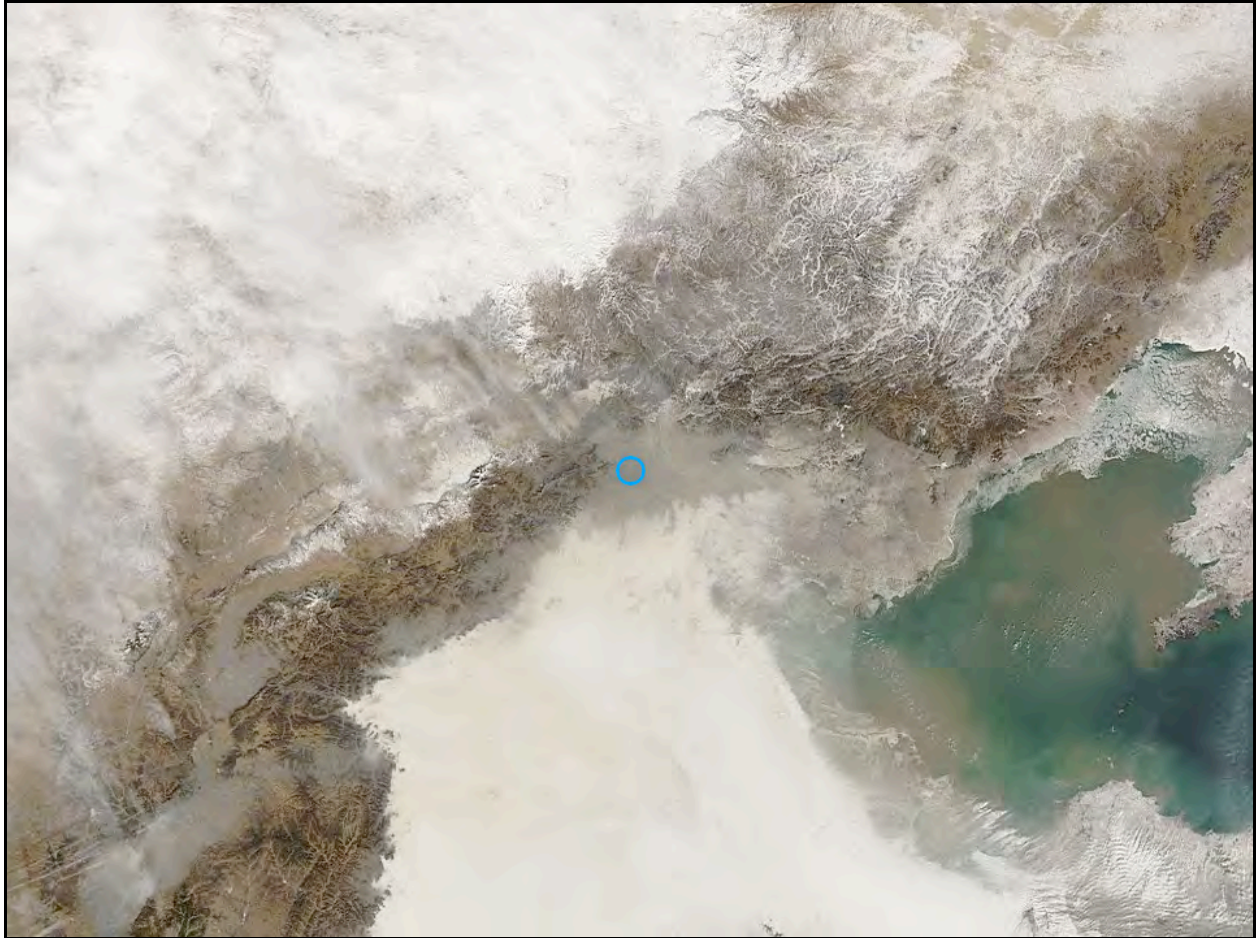
The highest reading occurred at 2013-1-12 — 2000 CST — PM 2.5 — 886; 755.



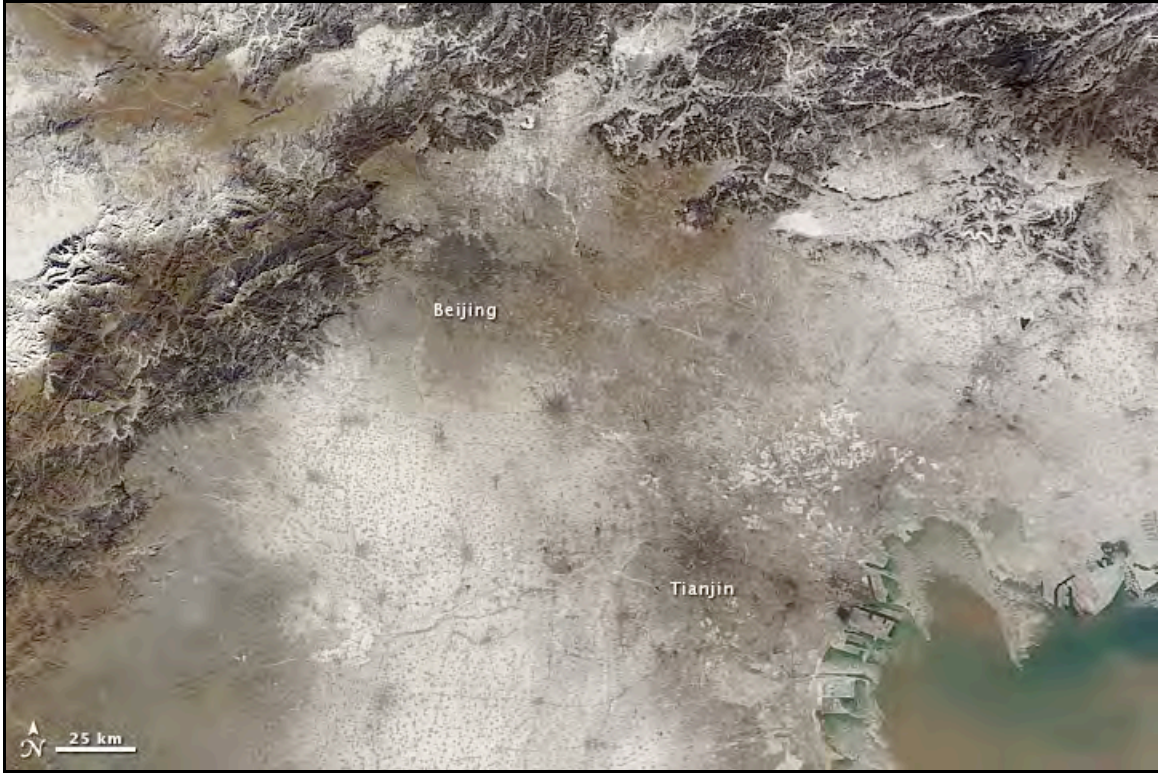
**NASA image 2013-1-13-0350-UTC — 1200 CST, East China, Terra AERONET 1km
BeijingAir Reading 2013-1-13 — 1200 CST: PM 2.5 — 631 conc; 586 AQI**



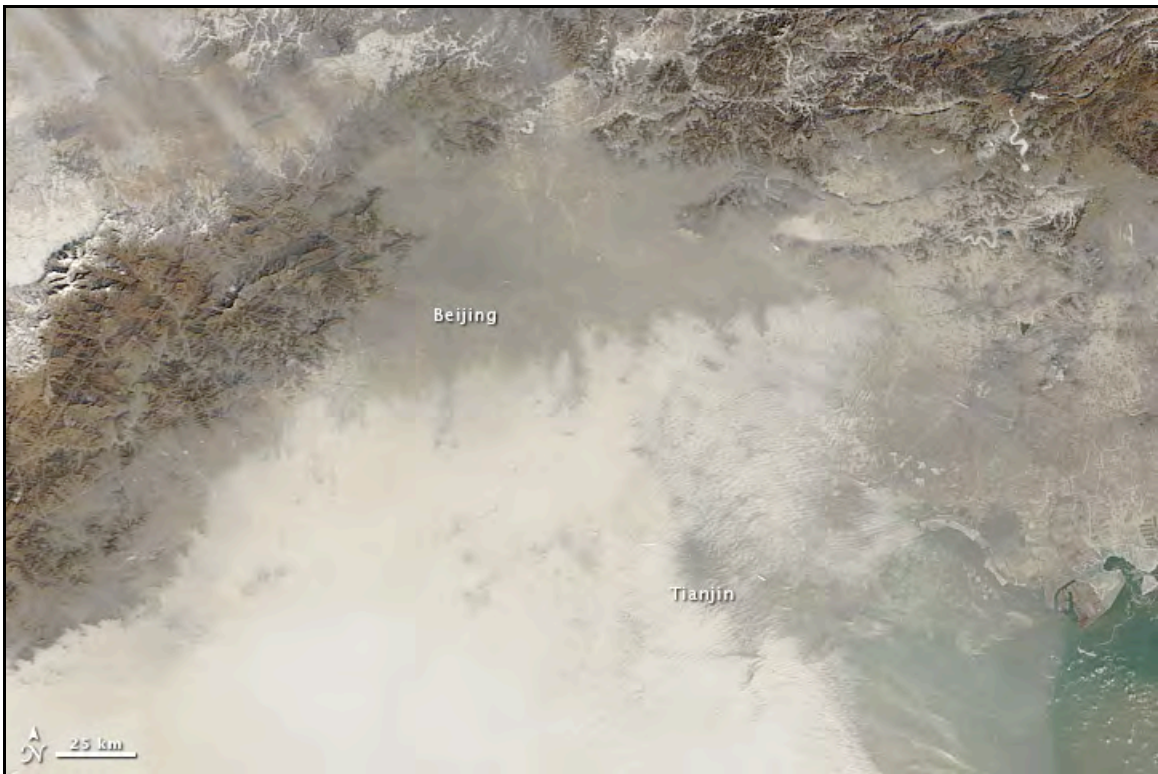
**NASA image 2013-1-13-0350-UTC — 1150 CST, East China, Terra FAS 2km
BeijingAir Reading 2013-1-13—1200 CST: PM 2.5—631 conc; 586 AQI**



**NASA image 2013-1-14-0255-UTC — 1055 CST, East China, Terra AERONET 1km
BeijingAir Reading 2013-1-14 — 1200 CST: PM 2.5 — 343 conc; 393 AQI**



Beijing Image acquired 2013-1-3 Terra



Beijing Image acquired 2013-1-14 Terra

Air Quality Suffering in China

Earth Observatory January 15, 2013

<http://earthobservatory.nasa.gov/IOTD/view.php?id=80152>

Residents of Beijing and many other cities in China were warned to stay inside in mid-January 2013 as the nation faced one of the worst periods of air quality in recent history. The Chinese government ordered factories to scale back emissions, while hospitals saw spikes of more than 20 to 30 percent in patients complaining of respiratory issues, according to news reports.

The Moderate Resolution Imaging Spectroradiometer (MODIS) on NASA's Terra satellite acquired these natural-color images of northeastern China on January 3 (top) and January 14, 2013. The bottom image shows extensive haze, low clouds, and fog over the region. The brightest areas tend to be clouds or fog, which have a tinge of gray or yellow from the air pollution. Other cloud-free areas have a pall of gray and brown smog that mostly blots out the cities below. In areas where the ground is visible, some of the landscape is covered with lingering snow from storms in recent weeks. (Snow is more prominent in the January 3 image.)

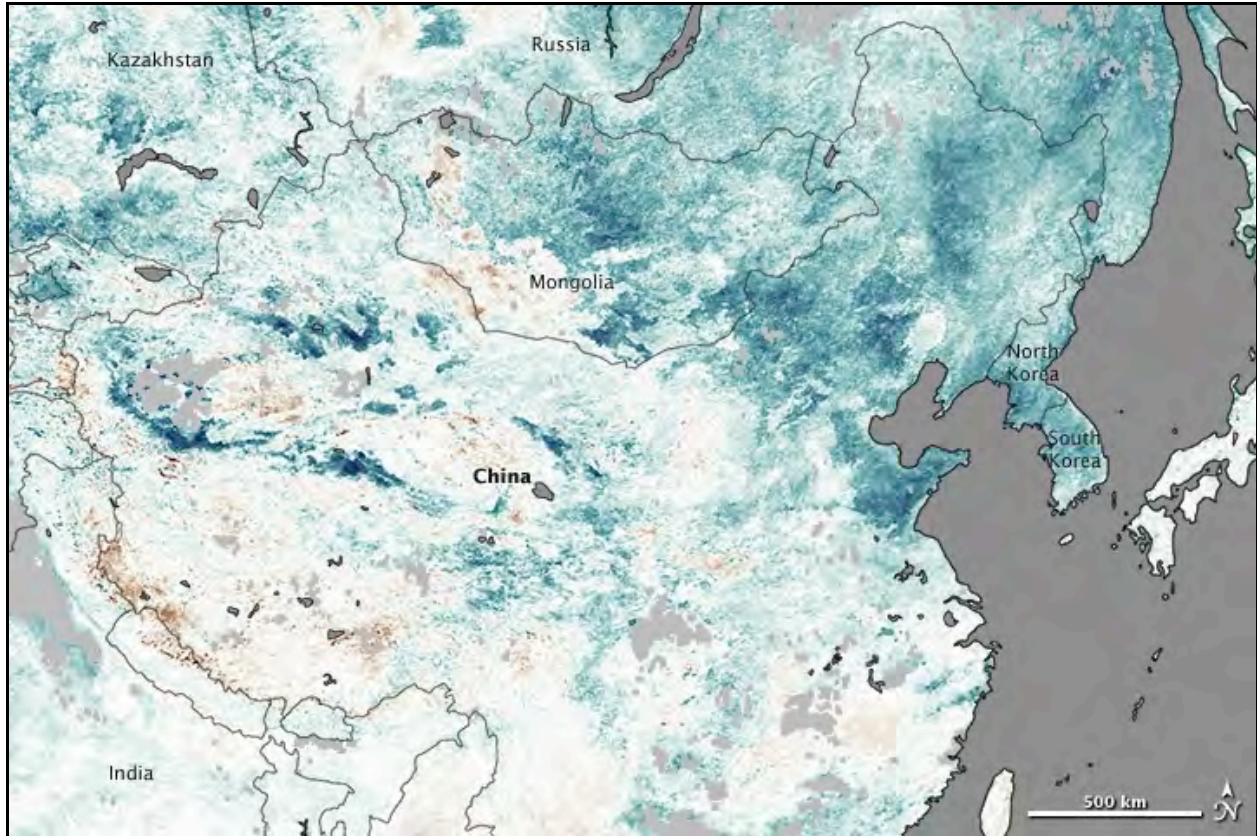
At the time that the January 14 image was taken by satellite, ground-based sensors at the U.S. Embassy in Beijing reported PM 2.5 measurements of 291 micrograms per cubic meter of air. Fine, airborne particulate matter (PM) that is smaller than 2.5 microns (about one thirtieth the width of a human hair) is considered dangerous because it is small enough to enter the passages of the human lungs. Most PM 2.5 aerosol particles come from the burning of fossil fuels and biomass (wood fires and agricultural burning). The World Health Organization considers PM 2.5 to be safe when it is below 25.

Also at the time of the image, the air quality index (AQI) in Beijing was 341. An AQI above 300 is considered hazardous to all humans, not just those with heart or lung ailments. AQI below 50 is considered good.

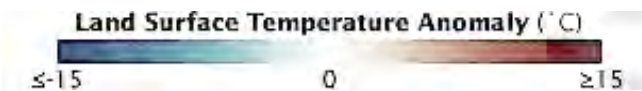
On January 12, the peak of the air crisis, the AQI was 775 on the U.S Embassy Beijing Air Quality Monitor—off the U.S. Environmental Protection Agency scale that goes to 500—and PM_{2.5} was 886 micrograms per cubic meter.

The question then becomes what would have caused such an extreme event?

The answer appears to be the weather.



Data acquired January 1 - 8, 2013



2013-1-24 EO: Unusual Cold in China and Northeast Asia

<http://earthobservatory.nasa.gov/NaturalHazards/view.php?id=80235>

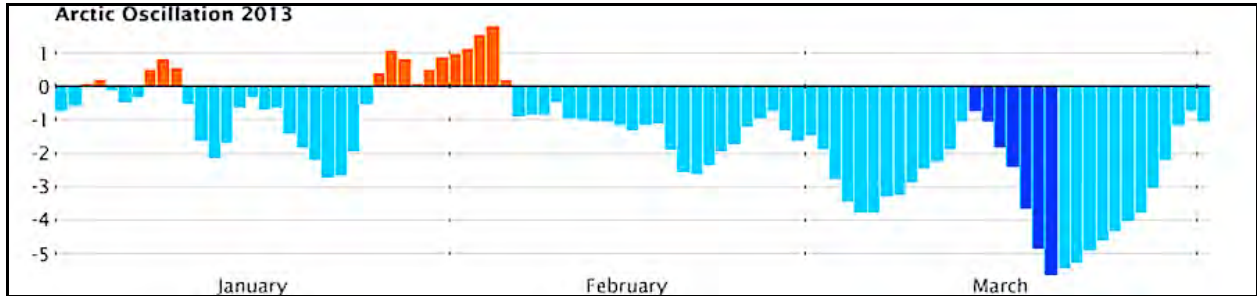
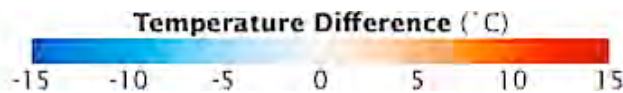
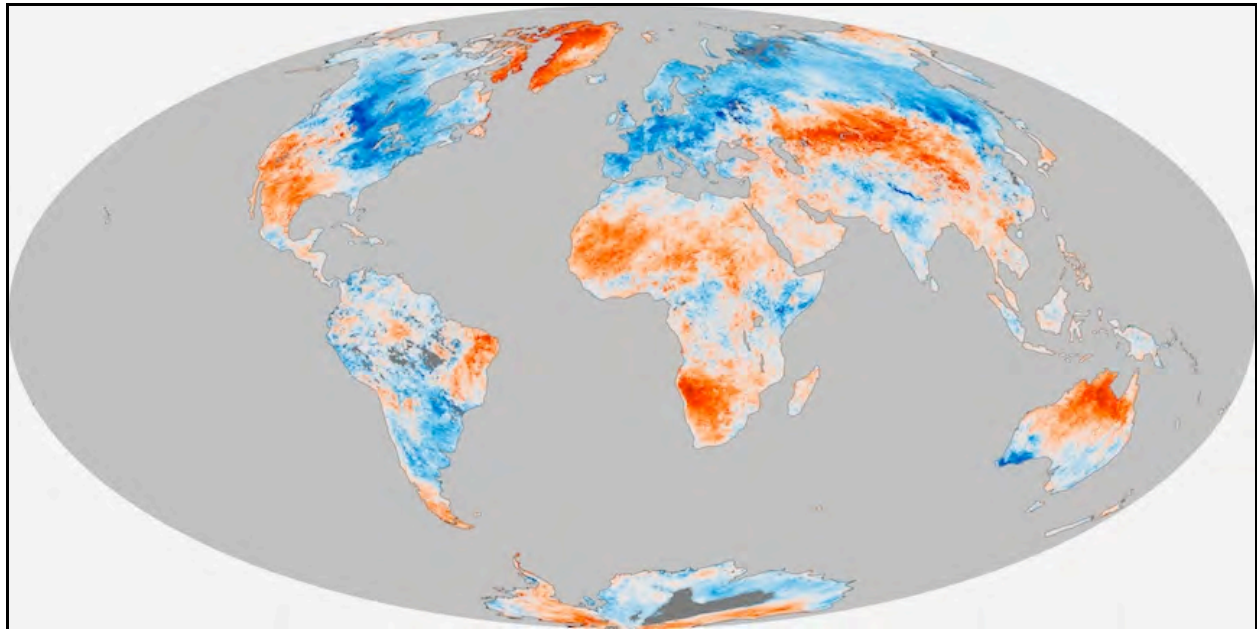
Between late November 2012 and early January 2013, China recorded its lowest temperatures in 28 years. In northeastern China, air temperatures dipped to -15.3°Celsius (4.5°Fahrenheit), according to the state news agency Xinhua. Frigid temperatures and blizzards stranded air and rail passengers, killed roughly 180,000 cattle, and forced authorities to open hundreds of shelters.

Despite isolated patches of warmer-than-usual temperatures (especially along the borders of India and Nepal), below-average temperatures dominated at the beginning of 2013, including areas of intense cold in western and northeastern China, Mongolia, Russia, and the Korean Peninsula. Frigid conditions froze part of the Yellow River (see next page) and trapped roughly 1,000 ships in Laizhou Bay, news sources said.

Although cold temperatures were most severe in northern China, many of the emergency shelters were opened in southern China, where residents had fewer resources to heat their homes, USA Today reported. **In northeastern China, the increased need to burn fuel likely contributed to China’s severe air pollution in January 2013.**

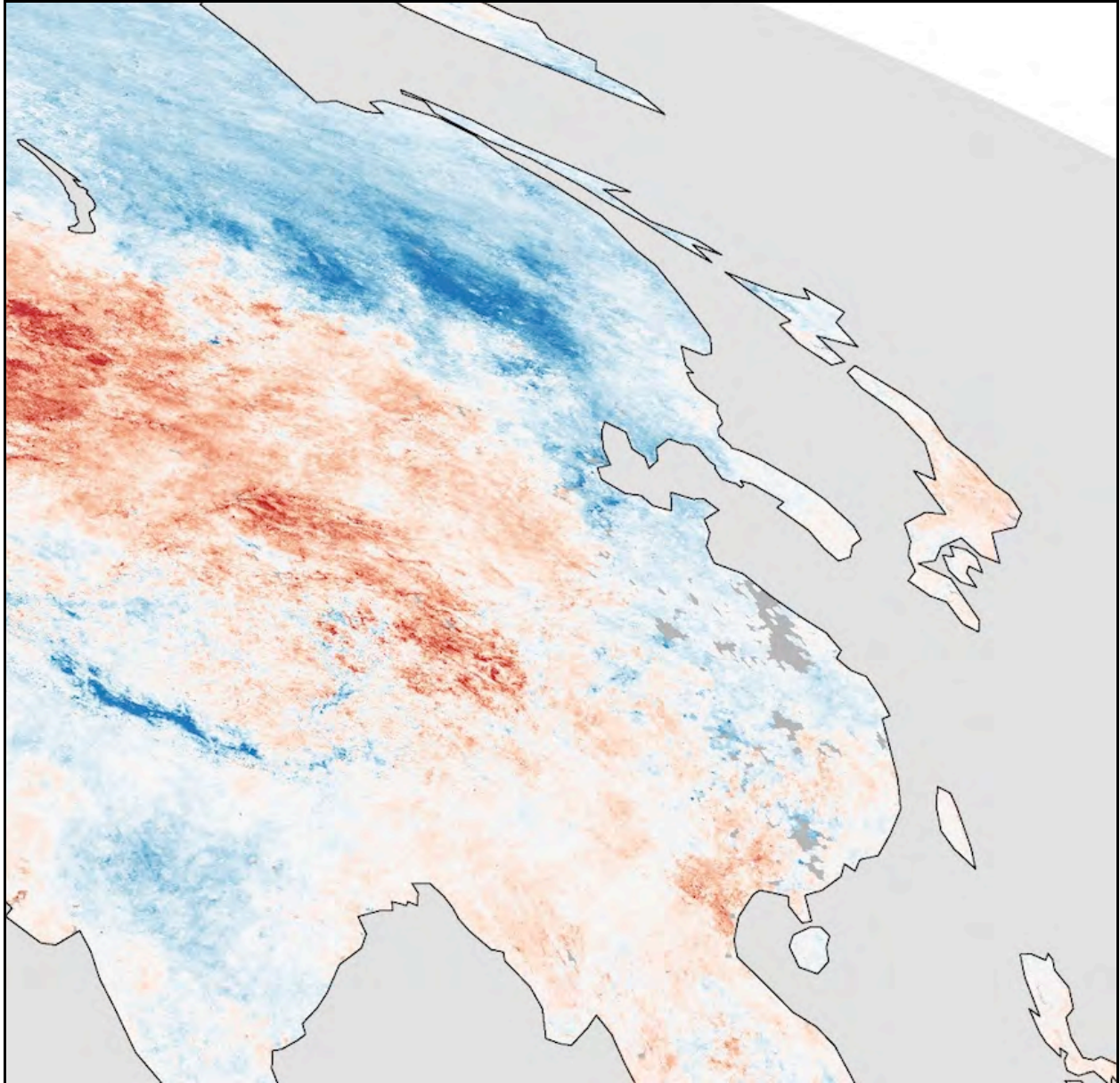


Warm Arctic, Chilly Mid-Latitudes



Atmospheric pressure patterns are constantly in flux, as air masses of differing temperatures and densities move around the skies. One key measure of pressure that meteorologists track closely is known as the Arctic Oscillation (AO) index, the difference in relative pressure between the Arctic and the mid-latitudes. Changes in the AO have can major impacts on weather patterns around the world.

When the AO index is in its “positive” phase, air pressure over the Arctic is low, pressure over the mid-latitudes is high, and prevailing winds confine extremely cold air to the Arctic. But when the AO is in its ”negative“ phase, the pressure gradient weakens. The pressure over the Arctic is not as low and pressure at mid-latitudes is not as high. In this negative phase, the AO enables Arctic air to flow to the south and warm air to move north. The temperature anomaly map above is based on data from the MODIS instrument on NASA’s Aqua satellite.



This map shows how this negative phase affected temperatures in East Asia. Beijing is approximately in the center of the image. Areas with above-average temperatures appear in red and orange, and areas with below-average temperatures appear in shades of blue. Much of Europe, Russia, and the eastern United States also saw unusually cool temperatures.

Web Reference for "Warm Arctic, Chilly Mid-Latitudes"
Earth Observatory article April 3, 2013
<http://earthobservatory.nasa.gov/IOTD/view.php?id=80804>