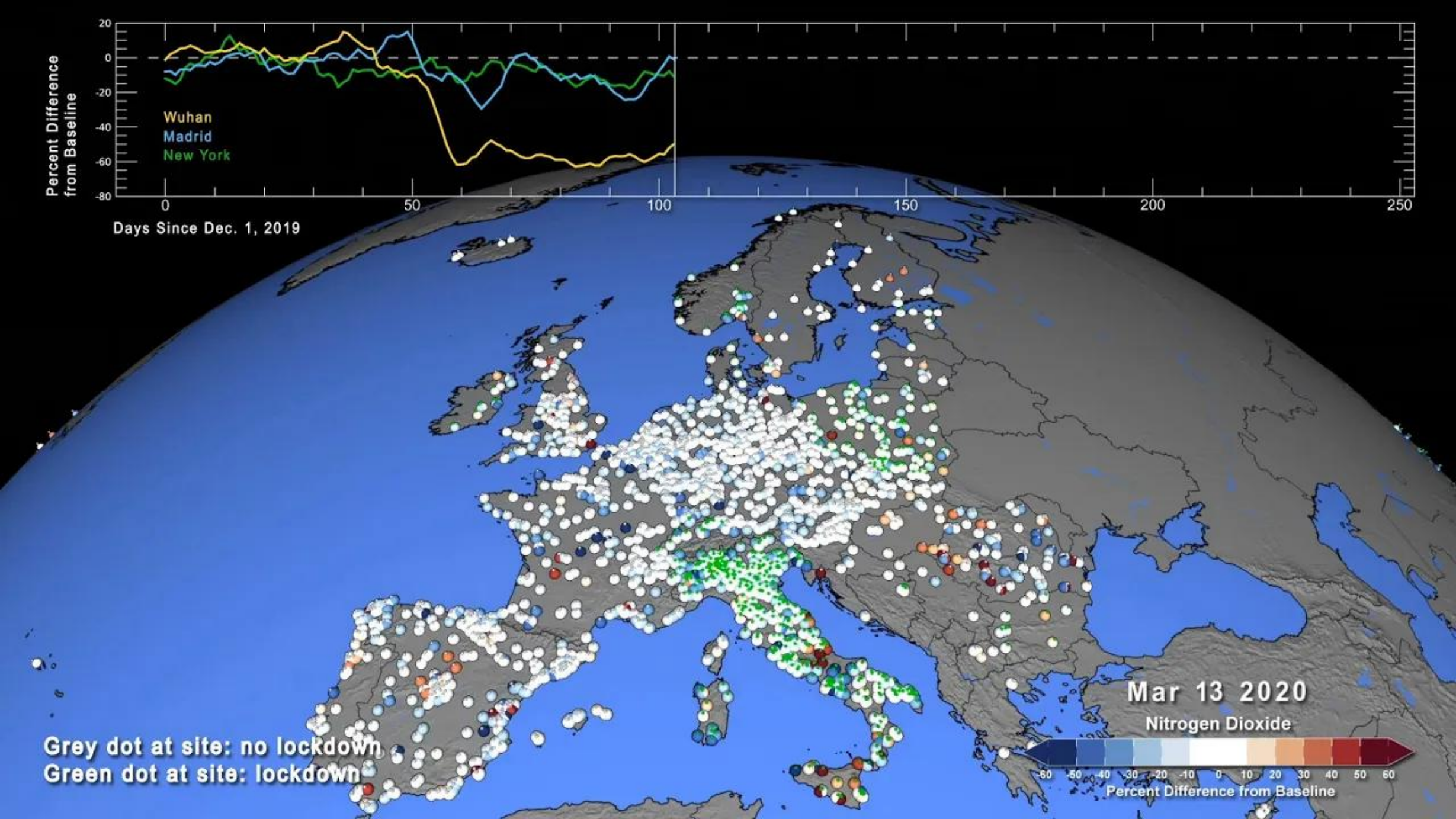
Percent Difference from Baseline
20
0
-20
-40
-60
-80
Wuhan
Madrid
New York
0
50
100
150
200
250
Days Since Dec. 1, 2019
Grey dot at site: no lockdown
Green dot at site: lockdown
Mar 13 2020
Nitrogen Dioxide
-60 -50 -40 -30 -20 -10 0 10 20 30 40 50 60
Percent Difference from Baseline

1
00:00:05,670 --> 00:00:03,110
computer models of earth's atmosphere

2
00:00:08,390 --> 00:00:05,680
can tell us a lot trained on how the

3
00:00:10,549 --> 00:00:08,400
atmosphere typically operates the models

4
00:00:12,870 --> 00:00:10,559
take in data about temperature wind

5
00:00:14,910 --> 00:00:12,880
speed humidity and more to give us

6
00:00:17,750 --> 00:00:14,920
important insights into the world around

7
00:00:19,910 --> 00:00:17,760
us computer models like nasa's geos

8
00:00:21,670 --> 00:00:19,920
model can help us study how chemicals

9
00:00:24,150 --> 00:00:21,680
move through the atmosphere how the

10
00:00:27,269 --> 00:00:24,160
oceans circulate and where air quality

11
00:00:29,429 --> 00:00:27,279
might be affected by fires and pollution

12
00:00:31,429 --> 00:00:29,439
these models can also provide a look at

13
00:00:33,750 --> 00:00:31,439

what might have been if circumstances

14
00:00:35,670 --> 00:00:33,760
were different for instance climate

15
00:00:37,430 --> 00:00:35,680
models can forecast how temperatures

16
00:00:39,590 --> 00:00:37,440
might change with different levels of

17
00:00:42,069 --> 00:00:39,600
carbon emissions

18
00:00:44,950 --> 00:00:42,079
in 2020 the world through the models a

19
00:00:48,069 --> 00:00:44,960
new test when people began behaving very

20
00:00:50,630 --> 00:00:48,079
very differently with almost no warning

21
00:00:52,950 --> 00:00:50,640
a global pandemic set in

22
00:00:55,350 --> 00:00:52,960
around the globe people stopped driving

23
00:00:57,350 --> 00:00:55,360
and flying in large numbers started

24
00:00:59,830 --> 00:00:57,360
staying home and completely changed

25
00:01:02,549 --> 00:00:59,840
their pollution patterns in particular

26
00:01:04,950 --> 00:01:02,559
emissions of nitrogen dioxide a common

27
00:01:07,030 --> 00:01:04,960
air pollutant released by cars airplanes

28
00:01:08,550 --> 00:01:07,040
and many factories declined

29
00:01:10,870 --> 00:01:08,560
significantly

30
00:01:12,870 --> 00:01:10,880
but just how much did the shutdown

31
00:01:15,270 --> 00:01:12,880
change our emissions

32
00:01:17,670 --> 00:01:15,280
nasa's geos atmospheric composition

33
00:01:19,990 --> 00:01:17,680
model offers an answer

34
00:01:22,710 --> 00:01:20,000
the model run functions by assuming that

35
00:01:24,630 --> 00:01:22,720
nothing was different in 2020 the people

36
00:01:26,149 --> 00:01:24,640
continued behaving roughly the same as

37
00:01:28,149 --> 00:01:26,159
they would have with no activity

38
00:01:30,710 --> 00:01:28,159

shutdowns adding the same number of

39
00:01:33,590 --> 00:01:30,720
atmospheric pollutants to the air

40
00:01:35,990 --> 00:01:33,600
it's then a matter of subtraction

41
00:01:37,990 --> 00:01:36,000
comparing those models to real-world

42
00:01:40,310 --> 00:01:38,000
observations made by satellites during

43
00:01:42,310 --> 00:01:40,320
the shutdowns shows how significant the

44
00:01:43,670 --> 00:01:42,320
decrease in pollution was in various

45
00:01:46,069 --> 00:01:43,680
cities

46
00:01:49,350 --> 00:01:46,079
activity shutdowns started in wuhan

47
00:01:51,749 --> 00:01:49,360
china and in january observed emissions

48
00:01:54,230 --> 00:01:51,759
of nitrogen dioxide began to diverge

49
00:01:57,030 --> 00:01:54,240
from what models predicted about 60

50
00:01:59,109 --> 00:01:57,040
percent less than predicted that is as

51
00:02:01,590 --> 00:01:59,119
the virus and the associated shutdowns

52
00:02:03,670 --> 00:02:01,600
moved west european cities began to

53
00:02:05,830 --> 00:02:03,680
experience decreased levels of nitrogen

54
00:02:07,429 --> 00:02:05,840
dioxide emissions as well

55
00:02:10,150 --> 00:02:07,439
in madrid spain

56
00:02:13,430 --> 00:02:10,160
nitrogen dioxide emissions were also 60

57
00:02:15,589 --> 00:02:13,440
percent less than modeled

58
00:02:18,150 --> 00:02:15,599
shortly after cities in the united

59
00:02:20,949 --> 00:02:18,160
states began to follow suit

60
00:02:22,949 --> 00:02:20,959
in march new york city shut down all but

61
00:02:25,670 --> 00:02:22,959
essential activities and emissions

62
00:02:28,949 --> 00:02:25,680
dropped by 45

63
00:02:31,509 --> 00:02:28,959

50 of the 61 analyzed cities show

64
00:02:33,110 --> 00:02:31,519
nitrogen dioxide reductions between 20

65
00:02:35,589 --> 00:02:33,120
and 50 percent

66
00:02:37,910 --> 00:02:35,599
clearly linking lower no2 emissions to

67
00:02:39,910 --> 00:02:37,920
pandemic-related restrictions and

68
00:02:42,309 --> 00:02:39,920
therefore human activity

69
00:02:43,990 --> 00:02:42,319
this sudden change in human behavior

70
00:02:45,990 --> 00:02:44,000
gives us new insights into the

71
00:02:47,430 --> 00:02:46,000
relationship between human activities

72
00:02:49,589 --> 00:02:47,440
and air pollution

73
00:02:51,750 --> 00:02:49,599
which still has many unanswered

74
00:02:53,990 --> 00:02:51,760
scientific questions

75
00:02:56,229 --> 00:02:54,000
the only way we can fully understand air

76
00:02:58,790 --> 00:02:56,239
pollution is by combining surface

77
00:02:59,830 --> 00:02:58,800
observations satellite data and computer

78
00:03:02,149 --> 00:02:59,840
models

79
00:03:04,869 --> 00:03:02,159
with nasa's satellite monitoring system

80
00:03:06,470 --> 00:03:04,879
and computing capabilities it's uniquely

81
00:03:08,869 --> 00:03:06,480
positioned to provide detailed

82
00:03:10,310 --> 00:03:08,879
information about air quality everywhere