1
00:00:23,509 --> 00:00:21,670
well in aerosol the physical definition

2
00:00:26,150 --> 00:00:23,519
of it it's a small particle which is

3
00:00:29,029 --> 00:00:26,160
suspended in the air can be suspended at

4
00:00:30,550 --> 00:00:29,039
any altitude but our main interest is in

5
00:00:32,470 --> 00:00:30,560
tropospheric aerosols which are

6
00:00:34,229 --> 00:00:32,480
suspended at altitudes from essentially

7
00:00:36,870 --> 00:00:34,239
from the ground to about eight

8
00:00:38,709 --> 00:00:36,880
kilometers in the atmosphere

9
00:00:40,709 --> 00:00:38,719
the total number of aerosols in the

10
00:00:42,830 --> 00:00:40,719
atmosphere is extremely large it's like

11
00:00:45,270 --> 00:00:42,840
the number of stars in a

12
00:00:47,990 --> 00:00:45,280
galaxy those are tiny particles most of

13
00:00:52,549 --> 00:00:48,000

them are invisible to a naked eye

14
00:00:57,350 --> 00:00:55,189
aerosol particles can be natural and can

15
00:00:59,510 --> 00:00:57,360
be created as a result of human

16
00:01:03,830 --> 00:00:59,520
activities and so those particles are

17
00:01:08,230 --> 00:01:06,310
natural aerosols can come from

18
00:01:10,469 --> 00:01:08,240
all places for example desert dust is

19
00:01:12,870 --> 00:01:10,479
blown off the surface of the sahara

20
00:01:14,230 --> 00:01:12,880
desert the asian deserts the australian

21
00:01:16,149 --> 00:01:14,240
deserts

22
00:01:18,789 --> 00:01:16,159
sea salt particles are produced when

23
00:01:23,429 --> 00:01:18,799
ocean waves break they produce a lot of

24
00:01:31,190 --> 00:01:25,350
essentially all kind of

25
00:01:36,149 --> 00:01:33,590
volcanoes they throw out a lot of

26
00:01:40,069 --> 00:01:36,159
volcanic ash and those are also natural

27
00:01:43,749 --> 00:01:41,749
all kinds of human activities produce

28
00:01:45,749 --> 00:01:43,759
different kinds of aerosols and the most

29
00:01:47,510 --> 00:01:45,759
typical example would be sulfate

30
00:01:50,710 --> 00:01:47,520
particles the result of

31
00:01:52,310 --> 00:01:50,720
combustion or soot particles

32
00:01:55,270 --> 00:01:52,320
on average an aerosol particle is

33
00:01:57,190 --> 00:01:55,280
estimated to to leave for about a week

34
00:01:59,190 --> 00:01:57,200
air sources are produced

35
00:02:01,990 --> 00:01:59,200
they're transported

36
00:02:08,949 --> 00:02:02,000
and eventually they disappear because

37
00:02:12,790 --> 00:02:10,790
aerosol particles can differ by their

38
00:02:14,309 --> 00:02:12,800

size and by their chemical composition

39
00:02:16,710 --> 00:02:14,319
and by their shape

40
00:02:18,710 --> 00:02:16,720
and all these inequalities can be mixed

41
00:02:20,630 --> 00:02:18,720
together and that's what makes aerosols

42
00:02:22,630 --> 00:02:20,640
so difficult to study at any given

43
00:02:25,589 --> 00:02:22,640
location particles of different types

44
00:02:27,990 --> 00:02:25,599
and of different origins can co-exist if

45
00:02:29,750 --> 00:02:28,000
a particle is for example generated some

46
00:02:32,229 --> 00:02:29,760
way in china it can be transported to

47
00:02:34,390 --> 00:02:32,239
the united states of america so this

48
00:02:35,990 --> 00:02:34,400
transport from different places makes

49
00:02:43,270 --> 00:02:36,000
their solar population at any given

50
00:02:47,509 --> 00:02:44,949
they have several roles in affecting

51
00:02:50,390 --> 00:02:47,519
climate for once they simply reflect

52
00:02:52,470 --> 00:02:50,400
sunlight back to space and this effect

53
00:02:54,390 --> 00:02:52,480
amounts to cooling of the atmosphere and

54
00:02:56,150 --> 00:02:54,400
on the surface

55
00:02:57,030 --> 00:02:56,160
but the same particles can also absorb

56
00:03:00,949 --> 00:02:57,040
light

57
00:03:04,630 --> 00:03:00,959
warmer and they warm the surrounding ear

58
00:03:07,270 --> 00:03:04,640
so this effect is to warm the atmosphere

59
00:03:09,190 --> 00:03:07,280
and how much light is reflected and how

60
00:03:10,790 --> 00:03:09,200
much is absorbed depends on the chemical

61
00:03:13,509 --> 00:03:10,800
composition of the particles on their

62
00:03:15,750 --> 00:03:13,519
size even on their shape

63
00:03:18,149 --> 00:03:15,760

there's another effect that aerosols

64
00:03:20,070 --> 00:03:18,159
exude on climate because they affect the

65
00:03:22,949 --> 00:03:20,080
properties of clouds

66
00:03:24,710 --> 00:03:22,959
and clouds are a major modulator of the

67
00:03:26,630 --> 00:03:24,720
amount of energy that reaches the

68
00:03:28,229 --> 00:03:26,640
surface and warms it

69
00:03:30,789 --> 00:03:28,239
and so by changing the properties of

70
00:03:33,990 --> 00:03:30,799
clouds and precipitation their soils can

71
00:03:37,350 --> 00:03:35,509
the most important knowledge that we

72
00:03:39,270 --> 00:03:37,360
have is that aerosol particles are

73
00:03:41,509 --> 00:03:39,280
extremely complex

74
00:03:43,589 --> 00:03:41,519
so we need to study the distribution of

75
00:03:46,869 --> 00:03:43,599
particles globally and the only way to

76
00:03:48,470 --> 00:03:46,879
do that is from satellites

77
00:03:50,470 --> 00:03:48,480
the knowledge about aerosols that we

78
00:03:52,550 --> 00:03:50,480
have tells us that the instrumentation

79
00:03:54,390 --> 00:03:52,560
on this satellite must also be very

80
00:03:57,110 --> 00:03:54,400
complicated and with this

81
00:03:59,270 --> 00:03:57,120
instrumentation we must be able to infer

82
00:04:02,229 --> 00:03:59,280
many properties of the aerosol particles

83
00:04:05,910 --> 00:04:03,910
and that's the purpose of the air soil

84
00:04:09,190 --> 00:04:05,920
polarimetry sensor which will fly as

85
00:04:13,910 --> 00:04:11,110
we are not interested so much in their

86
00:04:16,069 --> 00:04:13,920
total number as how they are distributed

87
00:04:18,150 --> 00:04:16,079
because their distribution affects local

88
00:04:19,749 --> 00:04:18,160

climate and that's why we need to know