
Aeronomy of Ice in the Mesosphere
AIM
HU VT LASP OSC SDL GMU USU NTNU NASA
2007 Jul 7
science @ NASA

1
00:00:09,990 --> 00:00:06,150
meteor smoke makes strange clouds

2
00:00:11,910 --> 00:00:10,000
presented by science at nasa

3
00:00:14,629 --> 00:00:11,920
anyone who's ever seen a noctilucent

4
00:00:17,189 --> 00:00:14,639
cloud or nlc would agree

5
00:00:19,269 --> 00:00:17,199
they look alien the electric blue

6
00:00:21,510 --> 00:00:19,279
ripples and pale tendrils of nlcs

7
00:00:23,990 --> 00:00:21,520
reaching across the night sky resemble

8
00:00:26,310 --> 00:00:24,000
something from another world

9
00:00:28,150 --> 00:00:26,320
researchers say that's not far off

10
00:00:30,950 --> 00:00:28,160
a key ingredient for the mysterious

11
00:00:32,950 --> 00:00:30,960
clouds comes from outer space

12
00:00:35,670 --> 00:00:32,960
we've detected bits of meteor smoke

13
00:00:37,990 --> 00:00:35,680

embedded in noctilucent clouds reports

14
00:00:40,069 --> 00:00:38,000
james russell of hampton university

15
00:00:42,470 --> 00:00:40,079
principal investigator of nasa's aim

16
00:00:44,549 --> 00:00:42,480
mission to study the phenomenon

17
00:00:46,790 --> 00:00:44,559
this discovery supports the theory that

18
00:00:49,590 --> 00:00:46,800
meteor dust is the nucleating agent

19
00:00:51,510 --> 00:00:49,600
around which nlcs form

20
00:00:53,670 --> 00:00:51,520
noctilucent clouds are a mystery dating

21
00:00:55,590 --> 00:00:53,680
back to the 19th century

22
00:00:58,310 --> 00:00:55,600
northern sky watchers first noticed them

23
00:01:00,310 --> 00:00:58,320
in 1885. about two years after the

24
00:01:02,389 --> 00:01:00,320
eruption of krakatoa

25
00:01:04,310 --> 00:01:02,399
ash from the indonesian volcano caused

26
00:01:07,670 --> 00:01:04,320
such splendid sunsets that evening

27
00:01:09,830 --> 00:01:07,680
skywatching became a worldwide pastime

28
00:01:13,590 --> 00:01:09,840
one observer in particular a german

29
00:01:15,109 --> 00:01:13,600
named tw backhouse noticed something odd

30
00:01:16,070 --> 00:01:15,119
he stayed outside longer than most

31
00:01:17,590 --> 00:01:16,080
people

32
00:01:18,550 --> 00:01:17,600
long enough for the twilight to fully

33
00:01:20,310 --> 00:01:18,560
darken

34
00:01:22,230 --> 00:01:20,320
and on some nights he saw wispy

35
00:01:23,990 --> 00:01:22,240
filaments glowing electric blue in the

36
00:01:25,830 --> 00:01:24,000
black sky

37
00:01:28,789 --> 00:01:25,840
scientists of the day figured they were

38
00:01:31,190 --> 00:01:28,799

some manifestation of volcanic dust

39
00:01:33,510 --> 00:01:31,200
eventually krakatoa's ash settled but

40
00:01:35,429 --> 00:01:33,520
the noctilucent clouds remained

41
00:01:37,109 --> 00:01:35,439
we're still seeing them today

42
00:01:39,789 --> 00:01:37,119
it seems clear now that the dust

43
00:01:41,670 --> 00:01:39,799
involved is not volcanic but rather

44
00:01:43,350 --> 00:01:41,680
extraterrestrial

45
00:01:45,030 --> 00:01:43,360
mark hervig of the company gats

46
00:01:46,550 --> 00:01:45,040
incorporated led the team that made the

47
00:01:48,950 --> 00:01:46,560
discovery

48
00:01:51,109 --> 00:01:48,960
using aim's solar occultation for ice

49
00:01:52,870 --> 00:01:51,119
experiment we found that about three

50
00:01:54,870 --> 00:01:52,880
percent of each ice crystal in a

51
00:01:56,310 --> 00:01:54,880
noctilucent cloud is meteoric said

52
00:01:58,230 --> 00:01:56,320
hervig

53
00:02:00,789 --> 00:01:58,240
the inner solar system is littered with

54
00:02:03,350 --> 00:02:00,799
meteoroids of all shapes and sizes

55
00:02:06,149 --> 00:02:03,360
from asteroid-sized chunks of rock to

56
00:02:07,990 --> 00:02:06,159
microscopic specks of dust

57
00:02:09,029 --> 00:02:08,000
when meteoroids hit our atmosphere and

58
00:02:10,869 --> 00:02:09,039
burn up

59
00:02:13,589 --> 00:02:10,879
they leave behind a haze of tiny

60
00:02:16,309 --> 00:02:13,599
particles suspended 70 kilometers to 100

61
00:02:19,030 --> 00:02:16,319
kilometers above earth's surface

62
00:02:20,390 --> 00:02:19,040
it's no coincidence that nlcs form 83

63
00:02:22,949 --> 00:02:20,400

kilometers high

64
00:02:24,949 --> 00:02:22,959
squarely inside the meteor smoke zone

65
00:02:26,710 --> 00:02:24,959
specs of meteor smoke act as gathering

66
00:02:28,869 --> 00:02:26,720
points where water molecules can

67
00:02:32,229 --> 00:02:28,879
assemble into ice crystals

68
00:02:34,869 --> 00:02:32,239
the process is called nucleation

69
00:02:37,830 --> 00:02:34,879
according to aim data the ice crystals

70
00:02:39,509 --> 00:02:37,840
of nlcs range in size from 20 to 70

71
00:02:41,430 --> 00:02:39,519
billionths of a meter

72
00:02:43,430 --> 00:02:41,440
the small size of the crystals explains

73
00:02:45,190 --> 00:02:43,440
the cloud's blue color

74
00:02:47,509 --> 00:02:45,200
small particles tend to scatter short

75
00:02:50,869 --> 00:02:47,519
wavelengths of light blue

76
00:02:53,750 --> 00:02:50,879
more strongly than long wavelengths red

77
00:02:55,430 --> 00:02:53,760
so when a beam of sunlight hits an nlc

78
00:02:57,509 --> 00:02:55,440
blue is the color that gets scattered

79
00:03:00,149 --> 00:02:57,519
down to earth

80
00:03:02,550 --> 00:03:00,159
meteor smoke explains much about nlcs

81
00:03:04,149 --> 00:03:02,560
but a key mystery still remains

82
00:03:05,670 --> 00:03:04,159
why are the clouds brightening and

83
00:03:08,309 --> 00:03:05,680
spreading

84
00:03:10,869 --> 00:03:08,319
in the 19th century nlcs were confined

85
00:03:12,390 --> 00:03:10,879
to high latitudes places like canada and

86
00:03:14,149 --> 00:03:12,400
scandinavia

87
00:03:16,070 --> 00:03:14,159
in recent times however they have been

88
00:03:17,110 --> 00:03:16,080

spotted as far south as colorado and

89
00:03:19,030 --> 00:03:17,120
utah

90
00:03:20,229 --> 00:03:19,040
the reason russell believes is climate

91
00:03:21,750 --> 00:03:20,239
change

92
00:03:23,110 --> 00:03:21,760
one of the greenhouse gases that has

93
00:03:25,190 --> 00:03:23,120
become more abundant in earth's

94
00:03:26,470 --> 00:03:25,200
atmosphere since the 19th century is

95
00:03:29,190 --> 00:03:26,480
methane

96
00:03:30,869 --> 00:03:29,200
it comes from landfills natural gas and

97
00:03:33,990 --> 00:03:30,879
petroleum systems

98
00:03:37,030 --> 00:03:34,000
agricultural activities and coal mining

99
00:03:39,190 --> 00:03:37,040
it turns out that methane boosts nlc's

100
00:03:41,430 --> 00:03:39,200
russell explains when methane makes its

101
00:03:43,190 --> 00:03:41,440
way into the upper atmosphere it is

102
00:03:45,990 --> 00:03:43,200
oxidized by a complex series of

103
00:03:47,990 --> 00:03:46,000
reactions to form water vapor

104
00:03:51,110 --> 00:03:48,000
this extra water vapor is then available

105
00:03:53,589 --> 00:03:51,120
to grow ice crystals for nlcs

106
00:03:55,589 --> 00:03:53,599
if this idea is correct noctilucent

107
00:03:57,190 --> 00:03:55,599
clouds are sort of a canary in a coal

108
00:03:58,710 --> 00:03:57,200
mine for one of the most important

109
00:04:01,270 --> 00:03:58,720
greenhouse gases

110
00:04:02,949 --> 00:04:01,280
and that says russell is a great reason

111
00:04:05,429 --> 00:04:02,959
to study them

112
00:04:06,789 --> 00:04:05,439
noctilucent clouds might look alien but

113
00:04:09,509 --> 00:04:06,799

they're telling us something very

114
00:04:11,830 --> 00:04:09,519
important about our own planet

115
00:04:12,949 --> 00:04:11,840
for more news about clouds alien and