



1
00:00:01,360 --> 00:00:05,190
houston station on two

2
00:00:11,430 --> 00:00:09,430
okay so i hit pause um we have

3
00:00:13,270 --> 00:00:11,440
one of our cameras that was specially

4
00:00:15,990 --> 00:00:13,280
modified and flown up

5
00:00:18,070 --> 00:00:16,000
with us for this expedition where the

6
00:00:20,870 --> 00:00:18,080
infrared blocking filter has been

7
00:00:23,349 --> 00:00:20,880
removed so this camera is sensitive to

8
00:00:25,509 --> 00:00:23,359
the near infrared region of the spectrum

9
00:00:27,509 --> 00:00:25,519
and here you see the infrared camera on

10
00:00:29,830 --> 00:00:27,519
top and mounted

11
00:00:33,110 --> 00:00:29,840
underneath it is a standard camera

12
00:00:36,310 --> 00:00:33,120
that's uh unmodified and we can take

13
00:00:37,910 --> 00:00:36,320

pictures now simultaneously of the same

14

00:00:40,150 --> 00:00:37,920

area so here's

15

00:00:41,190 --> 00:00:40,160

images cycling back and forth between

16

00:00:44,389 --> 00:00:41,200

visible

17

00:00:46,709 --> 00:00:44,399

and infrared and you can see

18

00:00:49,830 --> 00:00:46,719

the infrared part of the spectrum shows

19

00:00:51,990 --> 00:00:49,840

up in different shades of of red

20

00:00:54,389 --> 00:00:52,000

and and then the rest of the colors are

21

00:00:56,549 --> 00:00:54,399

pushed off into the the

22

00:00:57,590 --> 00:00:56,559

green and the blue channels on the

23

00:01:00,470 --> 00:00:57,600

camera

24

00:01:03,189 --> 00:01:00,480

and one of the aspects of infrared

25

00:01:05,429 --> 00:01:03,199

imagery is that it shows up agriculture

26

00:01:08,230 --> 00:01:05,439

in a in a very interesting way in more

27

00:01:10,789 --> 00:01:08,240

of a technical way and and it allows you

28

00:01:13,109 --> 00:01:10,799

to investigate more into the health of

29

00:01:15,670 --> 00:01:13,119

the crops and what's going on

30

00:01:17,510 --> 00:01:15,680

this is in the salton sea area

31

00:01:19,749 --> 00:01:17,520

in uh in

32

00:01:22,630 --> 00:01:19,759

california and you can see a little uh

33

00:01:24,950 --> 00:01:22,640

evaporative pond region in the sort of

34

00:01:27,429 --> 00:01:24,960

the center section

35

00:01:29,510 --> 00:01:27,439

here's how it looks in the infrared

36

00:01:31,109 --> 00:01:29,520

so again wherever there's plants you see

37

00:01:34,069 --> 00:01:31,119

bright red

38

00:01:36,390 --> 00:01:34,079

so the earth observation scientists will

39

00:01:39,190 --> 00:01:36,400

be able to take these kinds of images

40

00:01:40,469 --> 00:01:39,200

and compare directly the visible with

41

00:01:41,990 --> 00:01:40,479

the infrared

42

00:01:45,510 --> 00:01:42,000

where human beings make their cities

43

00:01:47,590 --> 00:01:45,520

it's primarily gray in the infrared

44

00:01:51,670 --> 00:01:47,600

you can see there's agriculture around

45

00:01:55,190 --> 00:01:51,680

these city regions this is visible

46

00:01:58,870 --> 00:01:57,910

now this is in all of our desert region

47

00:02:02,630 --> 00:01:58,880

in

48

00:02:04,310 --> 00:02:02,640

a little skip of snow on them you can

49

00:02:07,190 --> 00:02:04,320

see that to the

50

00:02:08,949 --> 00:02:07,200

to the left running north and south

51

00:02:10,949 --> 00:02:08,959

and in all of our desert region

52

00:02:13,110 --> 00:02:10,959

indivisible it just looks like a bunch

53

00:02:15,910 --> 00:02:13,120

of desert brown well one of the neat

54

00:02:18,550 --> 00:02:15,920

things about infrared is that water

55

00:02:20,949 --> 00:02:18,560

reflects infrared differently so here's

56

00:02:23,030 --> 00:02:20,959

the same oliver desert region in

57

00:02:25,510 --> 00:02:23,040

infrared and notice that one section

58

00:02:28,869 --> 00:02:25,520

that just looked like dry brown desert

59

00:02:30,630 --> 00:02:28,879

actually is freestanding water

60

00:02:32,550 --> 00:02:30,640

we even have some experiments on space

61

00:02:35,830 --> 00:02:32,560

station where we're imaging croplands in

62

00:02:38,309 --> 00:02:35,840

the united states and it's typically

63

00:02:40,229 --> 00:02:38,319

put on hold during the winter because we

64

00:02:42,710 --> 00:02:40,239

don't raise many crops during the winter

65

00:02:44,309 --> 00:02:42,720

but what i'm finding is you take

66

00:02:46,550 --> 00:02:44,319

infrared imagery

67

00:02:47,990 --> 00:02:46,560

of snow-covered scenes particularly with

68

00:02:50,710 --> 00:02:48,000

ice

69

00:02:52,390 --> 00:02:50,720

covered lakes and you can see some

70

00:02:57,990 --> 00:02:52,400

interesting detail that starts to show

71

00:02:58,000 --> 00:03:03,509

and here here is the infrared

72

00:03:08,229 --> 00:03:04,869

oh

73

00:03:10,470 --> 00:03:08,239

this is los angeles in the visible and

74

00:03:15,190 --> 00:03:10,480

you can see it's primarily gray

75

00:03:19,430 --> 00:03:16,949

and here it is in the infrared and

76
00:03:21,589 --> 00:03:19,440
notice the parts and the reserves show

77
00:03:24,470 --> 00:03:21,599
up quite well in the infrared you can

78
00:03:26,630 --> 00:03:24,480
see where there is lots of greenness

79
00:03:32,070 --> 00:03:26,640
in the los angeles region

80
00:03:34,710 --> 00:03:33,830
this is

81
00:03:40,229 --> 00:03:34,720
is

82
00:03:44,470 --> 00:03:40,239
and you can see the border between san

83
00:03:49,750 --> 00:03:46,710
and here it is in the infrared

84
00:03:52,630 --> 00:03:49,760
uh borders visible the cities are

85
00:03:55,350 --> 00:03:52,640
visible but all the the greeneries

86
00:03:58,710 --> 00:03:55,360
within the city show up quite clearly in

87
00:04:03,429 --> 00:04:00,789
so we're going to take a peek at some oh

88
00:04:04,789 --> 00:04:03,439

that's a very various cities now this

89

00:04:09,429 --> 00:04:04,799

this is

90

00:04:12,630 --> 00:04:09,439

in the amazon region if you take a

91

00:04:15,990 --> 00:04:12,640

visible picture of this area it looks

92

00:04:17,749 --> 00:04:16,000

kind of a misty foggy blue just because

93

00:04:19,830 --> 00:04:17,759

of the water vapor and the haze and the

94

00:04:22,390 --> 00:04:19,840

clouds and the infrared tends to cut

95

00:04:24,629 --> 00:04:22,400

through that and you can see the detail

96

00:04:30,629 --> 00:04:24,639

and the structure of the jungle canopies

97

00:04:36,150 --> 00:04:33,670

now this is a region in africa a jungle

98

00:04:38,469 --> 00:04:36,160

region and you can see in this visible

99

00:04:41,830 --> 00:04:38,479

picture where the jungles have been

100

00:04:43,430 --> 00:04:41,840

cleared for agricultural

101
00:04:45,990 --> 00:04:43,440
this is the

102
00:04:49,030 --> 00:04:46,000
ganges river delta there's a reserve

103
00:04:52,310 --> 00:04:49,040
there and this is lush mangrove jungle

104
00:04:54,870 --> 00:04:52,320
and you can see again it's bright red

105
00:04:56,629 --> 00:04:54,880
lots of greenery down there but look on

106
00:04:58,230 --> 00:04:56,639
the left-hand edge you can see that

107
00:04:59,830 --> 00:04:58,240
there's

108
00:05:01,029 --> 00:04:59,840
some sections there that aren't quite as

109
00:05:03,029 --> 00:05:01,039
red

110
00:05:05,110 --> 00:05:03,039
and we'll find out why

111
00:05:08,070 --> 00:05:05,120
this is another region in

112
00:05:11,510 --> 00:05:08,080
the ganges river delta in india and you

113
00:05:12,550 --> 00:05:11,520

can see where the reserves are

114

00:05:19,430 --> 00:05:12,560

where

115

00:05:23,110 --> 00:05:19,440

you can see in between there there are

116

00:05:26,150 --> 00:05:23,120

rows of mangroves

117

00:05:28,629 --> 00:05:26,160

and this this is a one of my favorites

118

00:05:29,510 --> 00:05:28,639

this is an oblique view of guatemala

119

00:05:32,230 --> 00:05:29,520

showing

120

00:05:35,029 --> 00:05:32,240

the jungle region with volcanoes popping

121

00:05:37,909 --> 00:05:35,039

up out of the area

122

00:05:39,350 --> 00:05:37,919

and this is along somewhere along the

123

00:05:42,310 --> 00:05:39,360

western

124

00:05:45,270 --> 00:05:42,320

coast of south america

125

00:05:46,870 --> 00:05:45,280

in chile there's some regions where the

126
00:05:48,870 --> 00:05:46,880
mountains come right up to the edge of

127
00:05:50,550 --> 00:05:48,880
the ocean and there's not a lot of plant

128
00:05:53,110 --> 00:05:50,560
material there as you can see the

129
00:05:55,590 --> 00:05:53,120
mountains are basically gray but there's

130
00:05:57,990 --> 00:05:55,600
a little river delta and

131
00:06:00,950 --> 00:05:58,000
lots of vegetation on this river delta

132
00:06:03,110 --> 00:06:00,960
shows up quite well in the infrared

133
00:06:04,550 --> 00:06:03,120
this is in japan i haven't quite

134
00:06:07,350 --> 00:06:04,560
identified it i'm not sure which

135
00:06:08,070 --> 00:06:07,360
volcanoes these are in japan but you can

136
00:06:11,189 --> 00:06:08,080
see

137
00:06:13,189 --> 00:06:11,199
the cities around the volcano regions

138
00:06:15,909 --> 00:06:13,199

where the snow-capped mountain there you

139

00:06:18,790 --> 00:06:15,919

can see where the plants are and where

140

00:06:22,309 --> 00:06:18,800

the cities are

141

00:06:24,710 --> 00:06:22,319

and this is tokyo and again typifies

142

00:06:28,309 --> 00:06:24,720

large urban areas where you have vast

143

00:06:29,350 --> 00:06:28,319

expanses of a city and it's primarily

144

00:06:31,350 --> 00:06:29,360

gray

145

00:06:34,870 --> 00:06:31,360

and then you can see where the where the

146

00:06:37,189 --> 00:06:34,880

plants are thriving

147

00:06:39,510 --> 00:06:37,199

and this is in the bahamas

148

00:06:41,670 --> 00:06:39,520

in the caribbean area

149

00:06:43,749 --> 00:06:41,680

very beautiful from orbit you see the

150

00:06:46,230 --> 00:06:43,759

turquoise water with a little island

151
00:06:48,150 --> 00:06:46,240
circling it there's no other place on

152
00:06:50,070 --> 00:06:48,160
the planet that looks quite like this

153
00:06:53,589 --> 00:06:50,080
but let's see what this looks like in

154
00:06:59,990 --> 00:06:56,950
almost looks like van gogh and matisse

155
00:07:01,990 --> 00:07:00,000
got together to make a painting and mix

156
00:07:04,550 --> 00:07:02,000
their palettes not only are they

157
00:07:07,189 --> 00:07:04,560
beautiful from an artistic point of view

158
00:07:08,150 --> 00:07:07,199
but i'm hoping the earth scientists will

159
00:07:11,110 --> 00:07:08,160
find

160
00:07:14,950 --> 00:07:11,120
information here that that they will

161
00:07:20,469 --> 00:07:17,589
and the camera we have has the

162
00:07:22,950 --> 00:07:20,479
capability of making high definition

163
00:07:25,350 --> 00:07:22,960

movies and so i took the liberty to make

164

00:07:27,830 --> 00:07:25,360

uh an infrared movie and this is a path

165

00:07:33,430 --> 00:07:27,840

going over the andes mountains into

166

00:07:39,189 --> 00:07:35,990

and that concludes this gun

167

00:07:41,430 --> 00:07:39,199

this one was about the color infrared a

168

00:07:44,230 --> 00:07:41,440

digital camera that we now have on space

169

00:07:46,629 --> 00:07:44,240

station that replaces our lost

170

00:07:48,950 --> 00:07:46,639

capability a color infrared film since

171

00:07:52,869 --> 00:07:48,960

we no longer fly from the space station

172

00:07:54,950 --> 00:07:52,879

and now we as crew can use this camera

173

00:07:59,189 --> 00:07:54,960

to make those still images

174

00:08:00,869 --> 00:07:59,199

and uh and movies of targets that will

175

00:08:03,350 --> 00:08:00,879

be of interest to not only earth

176

00:08:08,070 --> 00:08:03,360

scientists but also just