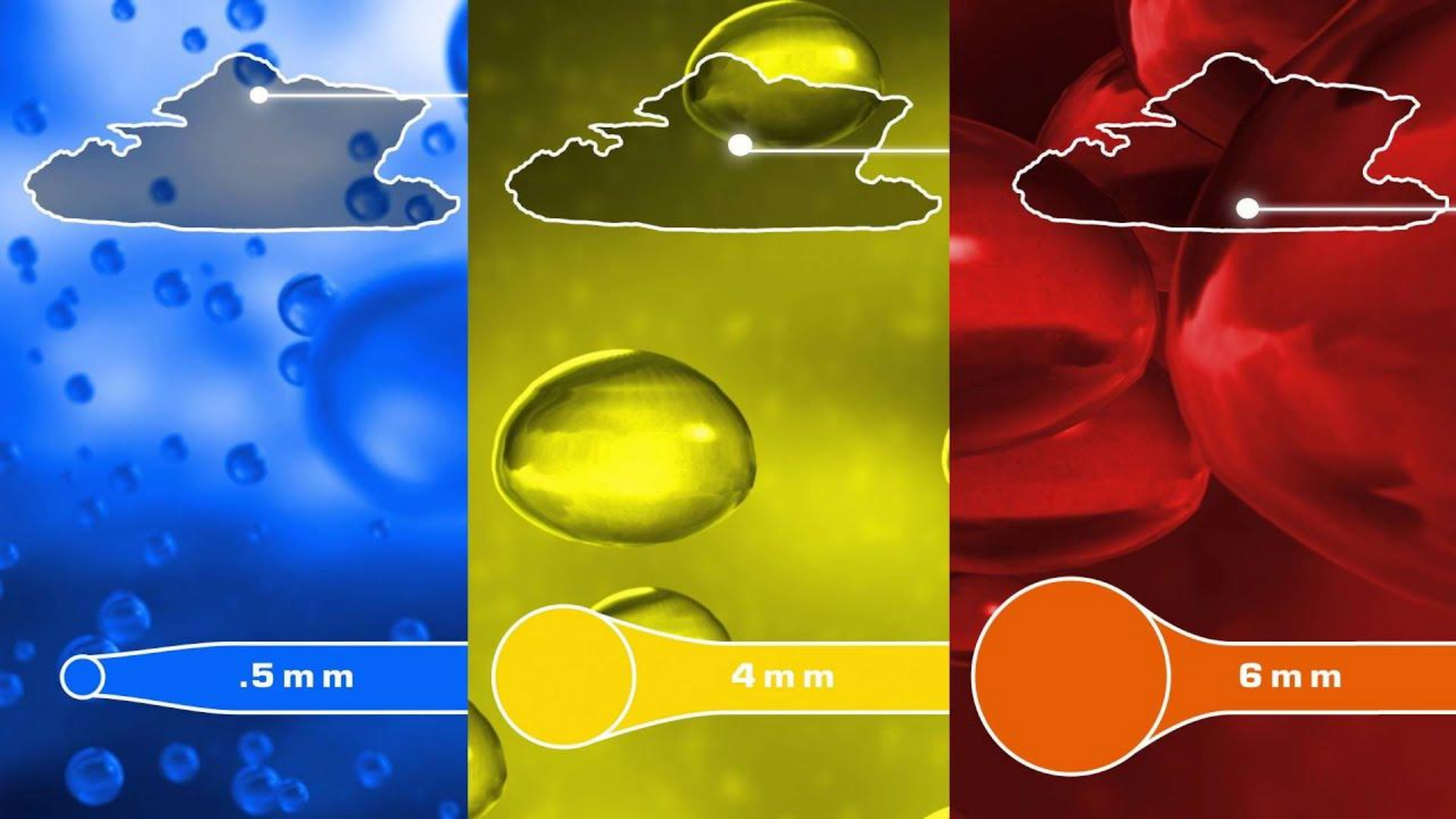
.5 m m
4 m m
6 m m

1
00:00:00,033 --> 00:00:02,202
If you've ever looked at the
weather forecast,

2
00:00:02,202 --> 00:00:04,338
you might be familiar with a
percentage.

3
00:00:04,338 --> 00:00:06,540
It's the probability of
precipitation.

4
00:00:06,540 --> 00:00:10,344
For example, sixty percent
rain means that when similar

5
00:00:10,344 --> 00:00:13,580
forecasts have occurred in
the past, only sixty percent

6
00:00:13,580 --> 00:00:14,815
actually rained.

7
00:00:14,815 --> 00:00:18,385
Uncertainties can sometimes
leave us unprepared for storms

8
00:00:18,385 --> 00:00:19,286
and floods.

9
00:00:19,286 --> 00:00:23,423
But predictions improve as
we monitor storms in greater
detail

10
00:00:23,423 --> 00:00:26,193
and now NASA's
newest precipitation satellite

11

00:00:26,193 --> 00:00:30,564
GPM is measuring the individual
water drops that make up a
storm.

12
00:00:30,564 --> 00:00:32,866
GPM's the first time
we've been able to get this type

13
00:00:32,866 --> 00:00:34,801
of information on
a global scale.

14
00:00:34,801 --> 00:00:39,339
To understand why this matters,
it helps to know how weather
predictions are made.

15
00:00:39,339 --> 00:00:42,943
First, computer programs
known as weather models turn the

16
00:00:42,943 --> 00:00:46,246
processes in the atmosphere into
math equations,

17
00:00:46,246 --> 00:00:48,282
governed by the laws of physics.

18
00:00:48,282 --> 00:00:51,985
These equations receive
measurements of the land,
sea, and air

19
00:00:51,985 --> 00:00:55,155
to get a view of the
atmosphere's current state

20
00:00:55,155 --> 00:00:57,858
then predicts how it
will change over time.

21
00:00:57,858 --> 00:01:00,727
To ensure predictions are
correct, equations need

22
00:01:00,727 --> 00:01:03,163
to represent the
atmosphere accurately.

23
00:01:03,163 --> 00:01:06,400
But one thing that's uncertain
in the equations is how

24
00:01:06,400 --> 00:01:09,770
precipitation is
structured within storms.

25
00:01:09,770 --> 00:01:13,340
A storm is made up of water
drops of different sizes but
without

26
00:01:13,340 --> 00:01:16,510
knowing these measurements many
weather models operate under an

27
00:01:16,510 --> 00:01:19,046
assumption. What they do
instead is have some assumption

28
00:01:19,046 --> 00:01:22,516
about how that's distributed.
So as an example, for every one

29
00:01:22,516 --> 00:01:25,919
hundred small drops, there would
be ten medium sized drops or

30
00:01:25,919 --> 00:01:28,755
just one large drop.

Assumptions are made because

31
00:01:28,755 --> 00:01:32,326
researchers have only studied
drops in isolated areas.

32
00:01:32,326 --> 00:01:35,796
Now for the first time, GPM
is measuring the size and

33
00:01:35,796 --> 00:01:37,698
distribution of
drops around the world.

34
00:01:37,698 --> 00:01:41,735
If we go into a storm we'll
see varying drops sizes labeled

35
00:01:41,735 --> 00:01:42,402
different colors.

36
00:01:42,402 --> 00:01:47,007
Near the top, there
are many small drops
around .5,1 and

37
00:01:47,007 --> 00:01:51,745
2 millimeters. As they
fall to the middle of
the storm, some drops

38
00:01:51,745 --> 00:01:55,048
bump into others
causing them to
grow in size.

39
00:01:55,048 --> 00:02:00,887
Right at the bottom,
drops can grow around
four, five and six millimeters.

40
00:02:00,887 --> 00:02:05,292
This 3-D mosaic of
water drops is called
drop size distribution.

41
00:02:05,292 --> 00:02:08,628
It shows a high concentration of
small drops colored in blues and

42
00:02:08,628 --> 00:02:11,698
greens near the top and
lower concentrations of big

43
00:02:11,698 --> 00:02:14,534
drops colored in reds and
yellows near the bottom.

44
00:02:14,534 --> 00:02:17,771
A storm with a higher ratio of
red and yellow will contain more

45
00:02:17,771 --> 00:02:21,942
water than a higher ratio of
blue and green. Without knowing

46
00:02:21,942 --> 00:02:26,146
the relationship or ratio of
those large drops to the smaller
or medium-sized drops.

47
00:02:26,146 --> 00:02:28,048
We can have a big error in how
much

48
00:02:28,048 --> 00:02:31,018
rain we know fell and that can
have some big implications for

49
00:02:31,018 --> 00:02:35,656
knowing long term accumulations

which can help for flash flood
prediction.

50
00:02:35,656 --> 00:02:38,425
Not only does it give a more
accurate measurement of rainfall

51
00:02:38,425 --> 00:02:42,529
but drop sizes also give insight
into the winds within a storm.

52
00:02:42,529 --> 00:02:45,699
Thunderstorms have a lot of wind
associated with them and we all

53
00:02:45,699 --> 00:02:46,366
know this.

54
00:02:46,366 --> 00:02:48,769
But the strength of that wind
actually depends on the size of

55
00:02:48,769 --> 00:02:51,571
the drops that are falling
from that storm in some ways.

56
00:02:51,571 --> 00:02:54,908
Because a storm with small drops
will have more evaporation,

57
00:02:54,908 --> 00:02:57,711
which cools the air more,
which creates stronger winds.

58
00:02:57,711 --> 00:03:00,280
We've never been able to see
how water droplet sizes vary

59
00:03:00,280 --> 00:03:01,882
globally until now.

60
00:03:01,882 --> 00:03:04,151
So what causes them to
vary in different places?

61
00:03:04,151 --> 00:03:08,255
One factor is the temperature of
the environment drops grow in.

62
00:03:08,255 --> 00:03:10,724
In the mid-latitudes a lot
of those raindrops actually

63
00:03:10,724 --> 00:03:14,795
originated as snowflakes or even
hailstones and snowflakes can

64
00:03:14,795 --> 00:03:16,663
grow a lot larger
than cloud droplets can.

65
00:03:16,663 --> 00:03:19,332
So you have these big snowflakes
that then melt into big

66
00:03:19,332 --> 00:03:20,267
raindrops.

67
00:03:20,267 --> 00:03:23,637
In contrast, over the oceans and
in the tropics, they tend to be

68
00:03:23,637 --> 00:03:27,040
smaller and the reason is
because smaller raindrops tend

69
00:03:27,040 --> 00:03:30,877
to originate from clouds that
don't have any ice in them.

70
00:03:30,877 --> 00:03:33,613
It's worth noting,
however, these
measurements are only a

71
00:03:33,613 --> 00:03:37,117
small part of the
equation. The drop
size distribution is one of

72
00:03:37,117 --> 00:03:40,754
many factors that determines how
big a storm will grow, how long

73
00:03:40,754 --> 00:03:43,690
it will last and how much
rain it will ultimately produce.

74
00:03:43,690 --> 00:03:46,560
As GPM improves our
understanding of precipitation

75
00:03:46,560 --> 00:03:49,963
from space, that information
will be vital in improving