
AMAZON POPCORN
STORMS
SOUTH AMERICA

1
00:00:00,020 --> 00:00:04,020
The data gathered by GPM and its international

2
00:00:04,040 --> 00:00:08,070
constellation of satellites has generated an unprecedented global

3
00:00:08,090 --> 00:00:12,100
view of rain and snow. We can see

4
00:00:12,120 --> 00:00:16,140
daily patterns, seasonal movements, the rain in our own backyard,

5
00:00:16,160 --> 00:00:20,220
and weather sweeping the continent. We can analyze regional hazards,

6
00:00:20,240 --> 00:00:24,240
and precipitation that connects the globe.

7
00:00:24,260 --> 00:00:28,250
We can build up months of data, to years,

8
00:00:28,270 --> 00:00:32,280
and decades to look at how precipitation will change in a changing climate.

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00:00:32,300 --> 00:00:36,340
And we can explore precipitation, from pole to pole,

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00:00:36,360 --> 00:00:40,390
in a snapshot of a single week.

11
00:00:40,410 --> 00:00:44,420
Daily rainstorms are a constant near the Equator.

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00:00:44,440 --> 00:00:48,460
George: The interesting thing you see when you look at this is the daily pulse in convection,

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00:00:48,480 --> 00:00:52,490

what you might call the "popcorn." So for example over Africa,

14
00:00:52,510 --> 00:00:56,530
you see this regular pulsation of convection and

15
00:00:56,550 --> 00:01:00,540
then there are the longer lived events, which are squall lines. Because this happens to be during

16
00:01:00,560 --> 00:01:04,560
August, what we can see is the squall lines, which move across the continent

17
00:01:04,580 --> 00:01:08,600
starting in Ethiopia, and when they come off the coast, they're known as easterly waves.

18
00:01:08,620 --> 00:01:12,640
These are the precursors for some of the hurricanes that we see in the United States.

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00:01:12,660 --> 00:01:16,690
As you follow them across, the same kind of "popcorn" is taking place in

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00:01:16,710 --> 00:01:20,740
South America. And if you watch carefully you can see that

21
00:01:20,760 --> 00:01:24,770
line of convection starts along the coast in the afternoon and starts

22
00:01:24,790 --> 00:01:28,810
propogating in. And if you watch the pulsing, what you see is it takes about two days

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00:01:28,830 --> 00:01:32,870
for those squall lines in South America over the Amazon to reach

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00:01:32,890 --> 00:01:36,890
the Andes Mountains, at which point they sort of die out because they interact

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00:01:36,910 --> 00:01:40,940
with this very steep topography.
The Atlantic hurricane season was relatively

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00:01:40,960 --> 00:01:44,950
quiet in 2014, but GPM was able to track storms into

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00:01:44,970 --> 00:01:48,960
higher latitudes that nevertheless had unexpected impacts.

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00:01:48,980 --> 00:01:53,010
Dalia: One of the things we can observe with the 2014 hurricane season is actually Hurricane

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00:01:53,030 --> 00:01:57,050
Bertha, which you see here. Now it was kind of an unimpressive storm, but as you track it across

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00:01:57,070 --> 00:02:01,090
the Atlantic, what you can see is that it caused massive flooding and wind damage

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00:02:01,110 --> 00:02:05,130
in the UK. And so be being able to observe tropical cyclones in their

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00:02:05,150 --> 00:02:09,150
infancy in the tropics and see how they move all the way to the high latitudes

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00:02:09,170 --> 00:02:13,180
it gives us really important clues into how storms develop and intensify,

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00:02:13,200 --> 00:02:17,190
all the way into the higher latitudes as extratropical systems.

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00:02:17,210 --> 00:02:21,220
Gail: And it's really important to know what is happening in those high latitudes because

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00:02:21,240 --> 00:02:25,250
that's where the majority of people live; it's where the populations are. And so being able

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00:02:25,270 --> 00:02:29,270
to measure everything from the very light rain, which tends to occur at these

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00:02:29,290 --> 00:02:33,320
high latitudes, and the falling snow, as well as the very heavy precipitation

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00:02:33,340 --> 00:02:37,360
that occurs throughout the world, we have this data from the Global Precipitation

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00:02:37,380 --> 00:02:41,380
Measurement mission.
Meanwhile the Pacific Ocean saw a steady

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00:02:41,400 --> 00:02:45,440
barrage of tropical cyclones, slamming into Hawaii, the Philippines, and

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00:02:45,460 --> 00:02:49,460
Japan.
Gail: Here you can see the different cyclones and

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00:02:49,480 --> 00:02:53,510
typhoons as they move in the Pacific Ocean, one after another.

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00:02:53,530 --> 00:02:57,560
What's also important about these is knowing where they are over the vast

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00:02:57,580 --> 00:03:01,570
ocean so that once they get closer to land, operational users can make

46
00:03:01,590 --> 00:03:05,590
decisions about whether to evacuate people or not.

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00:03:05,610 --> 00:03:09,620
George: For example we see Supertyphoon Halong, which recurved

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00:03:09,640 --> 00:03:13,650
and then crossed Japan and started to interact with a mid-latitude cold front.

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00:03:13,670 --> 00:03:17,700
Once it did that it went, as we say, extratropical

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00:03:17,720 --> 00:03:21,730
and we can trace it all the way into the Northern Pacific Ocean.

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00:03:21,750 --> 00:03:25,760
As we head south through Asia, seasonal

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00:03:25,780 --> 00:03:29,810
rains drench India and its surrounding areas.

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00:03:29,830 --> 00:03:33,830
Dalia: One of the things we can observe about this dataset is where and when rain is happening.

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00:03:33,850 --> 00:03:37,880
And by being able to see, for example, this huge cluster of storms from the

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00:03:37,900 --> 00:03:41,930
monsoons, we can understand where we might get heavy rainfall that leads to

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00:03:41,950 --> 00:03:45,980
landslides and flooding. In fact what we observed during this time is actually a landslide

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00:03:46,000 --> 00:03:50,020
that caused 150 fatalities. You can actually see

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00:03:50,040 --> 00:03:54,050
what's happening just four hours after it occurred. And that near real time

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00:03:54,070 --> 00:03:58,090
capability is critical for different disaster

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00:03:58,110 --> 00:04:02,120
managers, understanding where we're getting floods and landslides around the world,

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00:04:02,140 --> 00:04:06,130
and when we look at the longer term, where we're getting the absence of rain, where we have

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00:04:06,150 --> 00:04:10,160
droughts, and understanding how those drought conditions are continuing or,

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00:04:10,180 --> 00:04:14,200
you know, maybe, improved because of rainfall that's coming.

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00:04:14,220 --> 00:04:18,240
With GPM we can look at how precipitation impacts very large populations,

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00:04:18,260 --> 00:04:22,290
and shed new light on the area where almost no one lives.

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00:04:22,310 --> 00:04:26,340
George: From South America, if we look to the south, we see the ocean that runs nearly around

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00:04:26,360 --> 00:04:30,360
the entire globe, which we call the Southern Ocean. This is really sort of

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00:04:30,380 --> 00:04:34,400
the terra incognita of precipitation, as far as I'm

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00:04:34,420 --> 00:04:38,450
concerned. The Southern Ocean has almost no land and very few ships.

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00:04:38,470 --> 00:04:42,470
It's a really challenging place; you don't go there unless you have to. As a result,

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00:04:42,490 --> 00:04:46,500
we know very little about the meteorology and the precipitation. When you look at that zone

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00:04:46,520 --> 00:04:50,530
what you see is the blue and darker purpley colors

73
00:04:50,550 --> 00:04:54,580
which represent snow. Because this is the Southern Hemisphere winter,

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00:04:54,600 --> 00:04:58,640
there's some snow that we see. We've known about these storms for a long time,

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00:04:58,660 --> 00:05:02,680
in terms of the cloud patterns but this is the first time we have a really great

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00:05:02,700 --> 00:05:06,710
visualization of the rain, which is underneath. This is one of the features of these

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00:05:06,730 --> 00:05:10,740
datasets is that it's like an X-ray that looks through the clouds and actually sees the rain.

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00:05:10,760 --> 00:05:14,780
Gail: When you take a step back and look at this dataset

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00:05:14,800 --> 00:05:18,820
from a global perspective, you can see the precipitation at the tropics, that looks like these

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00:05:18,840 --> 00:05:22,840
"popcorn" convective events. As well as these long-lasting

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00:05:22,860 --> 00:05:26,890
frontal systems in the high latitudes. And it's with this data