



CLOUDS &
PRECIPITATION

BIOLOGY & GEOLOGY

AEROSOLS

SURFACE CHANGE

MASS CHANGE

PAWA
BELNA

1
00:00:00,367 --> 00:00:04,471
The reason that we as humans care
about climate change

2
00:00:04,471 --> 00:00:07,040
is that it affects
not just the temperature,

3
00:00:07,040 --> 00:00:09,376
but a whole bunch of other things
that we care about.

4
00:00:09,376 --> 00:00:11,311
It affects soil moisture,

5
00:00:11,311 --> 00:00:15,148
which in turn affects our ability
to grow the things that we eat.

6
00:00:15,415 --> 00:00:17,484
It affects cloud cover.

7
00:00:17,817 --> 00:00:19,586
It affects rainfall patterns.

8
00:00:19,586 --> 00:00:24,657
It increases drought risk in some regions
and decreases it in other regions.

9
00:00:24,657 --> 00:00:28,495
Understanding our changing climate
on a planet with incredibly complex

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00:00:28,495 --> 00:00:32,532
and interconnected systems
is a massive scientific undertaking.

11
00:00:32,866 --> 00:00:36,503
And climate scientists like Kate

Marvel are using the data collected

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00:00:36,503 --> 00:00:41,441

by satellites from around the world
to improve the power of climate models.

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00:00:41,908 --> 00:00:43,810

If we want to make better decisions about

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00:00:43,810 --> 00:00:47,347

where we live, understand
the changing impacts of hurricanes

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00:00:47,680 --> 00:00:52,886

or improved predictions of fire seasons,
we need evolving climate models.

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00:00:52,886 --> 00:00:56,823

We don't have any observations
from the year 2050, from the year 2100,

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00:00:57,090 --> 00:01:00,360

but we can use our best knowledge
of physics and chemistry

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00:01:00,360 --> 00:01:04,297

and how the Earth system works
in order to look at the impact

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00:01:04,297 --> 00:01:07,801

of different emissions
trajectories, different policy scenarios.

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00:01:07,801 --> 00:01:12,072

Climate models provide a view
into our future from our globe

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00:01:12,072 --> 00:01:14,307

to our own communities.

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00:01:14,307 --> 00:01:18,445

As models advance, as they're tasked
with predicting the nature of the weather

23

00:01:18,445 --> 00:01:20,647

and the clouds over
smaller and smaller scales,

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00:01:20,747 --> 00:01:22,882

they're being asked
tougher questions like, Well,

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00:01:22,882 --> 00:01:26,586

what kind of clouds are happening
over those small scales and how often

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00:01:26,586 --> 00:01:28,421

and how heavily are they raining?

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00:01:28,421 --> 00:01:32,392

We expect roughly on really,
really large scales

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00:01:32,392 --> 00:01:36,196

climate change is making wet
regions wetter and dry regions drier.

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00:01:36,329 --> 00:01:40,066

But at the same time, it's shifting
the circulation of the atmosphere.

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00:01:40,100 --> 00:01:41,668

So the locations on a very,

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00:01:41,668 --> 00:01:45,271

very large scale of those wet
and dry regions are changing.

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00:01:45,738 --> 00:01:49,142

Climate models are composed of lots of different calculations on the

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00:01:49,142 --> 00:01:53,146

different behaviors of our atmosphere, our land and our oceans.

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00:01:53,546 --> 00:01:57,283

To accurately represent the natural world they need massive amounts

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00:01:57,283 --> 00:02:01,121

of satellite data over decades from NASA's Earth observation

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00:02:01,121 --> 00:02:04,057

fleet and its partners around the world.

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00:02:04,624 --> 00:02:08,027

Satellites like the Global Precipitation Measurement Mission

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00:02:08,027 --> 00:02:09,729

provide valuable rainfall data

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00:02:09,729 --> 00:02:14,100

on daily to seasonal timescales for the past 20 years.

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00:02:14,100 --> 00:02:16,870

And it's that information, along with a suite of other

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00:02:16,870 --> 00:02:20,206

data that go into climate model development.

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00:02:20,206 --> 00:02:25,078

Currently, the GPM microwave imager radiance data are used to generate

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00:02:25,078 --> 00:02:30,283

initial states of NASA climate models
and to guide climate model

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00:02:30,283 --> 00:02:35,021

solutions to be close to real states
by applying data assimilation techniques.

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00:02:35,221 --> 00:02:39,259

Data assimilation is the process
of combining many different sources of

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00:02:39,259 --> 00:02:44,664

Earth observations into models to improve
how we represent the Earth system.

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00:02:44,797 --> 00:02:48,868

Assimilating GPM microwave imager data

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00:02:48,868 --> 00:02:53,072

improved intensity and locations of storms

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00:02:53,072 --> 00:02:56,242

and precipitation
calculated by the climate models.

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00:02:56,643 --> 00:03:01,781

And once a climate model is developed,
it's tested over and over because, well...

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00:03:01,981 --> 00:03:03,483

All models are wrong,

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00:03:03,483 --> 00:03:06,853

but some models are useful,
so they're always going to be incomplete.

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00:03:06,853 --> 00:03:10,924

They're always going to be a not exact representation of the real world.

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00:03:10,924 --> 00:03:16,062

But we want to make sure that they are capturing important aspects of the Earth

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00:03:16,062 --> 00:03:19,432

so that we can treat them as credible going forward.

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00:03:19,832 --> 00:03:24,103

Typically, what happens is when you modify one part of the climate model,

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00:03:24,470 --> 00:03:27,106

other parts accidentally change.

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00:03:27,273 --> 00:03:28,775

It's kind of like the Whack-A-Mole game.

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00:03:28,775 --> 00:03:32,579

By hitting it down, we're improving it, we're killing the error, we're decreasing

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00:03:32,579 --> 00:03:36,282

the problem existing in a model, but another area pops up.

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00:03:36,282 --> 00:03:40,320

And that is why NASA observations of the Earth from space, the air and

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00:03:40,320 --> 00:03:44,591

the ground are critical to understanding how our Earth system works.

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00:03:44,591 --> 00:03:48,328

Observations help improve the modeling for our future here on Earth,

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00:03:48,328 --> 00:03:51,397

with new capabilities
to expand our knowledge.

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00:03:51,731 --> 00:03:56,502

NASA is launching satellites
and coordinating missions, like GPM,

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00:03:56,502 --> 00:04:01,908

giving us that long term, really accurate
satellite record of what's been going

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00:04:01,908 --> 00:04:05,912

on, not just the temperature rising,
but of various aspects

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00:04:05,912 --> 00:04:06,980

of the climate changing.

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00:04:06,980 --> 00:04:11,451

So precipitation and cloud cover
and soil moisture,

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00:04:11,451 --> 00:04:15,288

and a whole bunch of different
climate variables that people care about.

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00:04:15,455 --> 00:04:18,992

Continuing key observations of the Earth
is really important

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00:04:18,992 --> 00:04:24,264

to see how our atmosphere, land
and oceans are changing over time.

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00:04:24,264 --> 00:04:27,233

A long term record,
combined with cutting edge observations

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00:04:27,233 --> 00:04:30,837

from the new NASA

Earth System Observatory, will continue