1
00:00:22,050 --> 00:00:11,020
[music playing]

2
00:00:22,070 --> 00:00:26,090
[Narrator] Earth's climate is changing at an unprecedented rate.

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00:00:26,110 --> 00:00:31,100
As the planet heats up, researchers are developing new tools to help them

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00:00:31,120 --> 00:00:36,120
understand the complexity of global warming.

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00:00:36,140 --> 00:00:40,120
A new NASA mission named Glory is on the horizon.

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00:00:40,140 --> 00:00:47,130
It's goal is to gather critical data on some of the least understood aspects of climate change.

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00:00:47,150 --> 00:00:54,140
[Judith Lean] The compelling question about climate change that we would like to understand,

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00:00:54,160 --> 00:00:58,150
as a community really, and certainly as a science community

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00:00:58,170 --> 00:01:03,160
is how and why the Earth's climate changes.

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00:01:03,180 --> 00:01:09,170
The forcing that people are most familiar with is the increase in greenhouse gases,

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00:01:09,190 --> 00:01:15,170
especially carbon dioxide. But there are multiple other forcings as well.

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00:01:15,200 --> 00:01:20,180
One of the big uncertainties in the Intergovernmental Panel on Climate Change

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00:01:20,200 --> 00:01:23,190

report is the effect of aerosols.

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00:01:23,210 --> 00:01:26,200
[Brian Cairns] Greenhouse gases we know really well. The aerosols

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00:01:26,220 --> 00:01:32,230
we really don’t know very well at all.

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00:01:32,250 --> 00:01:36,250
[Narrator] Aerosols are suspended throughout Earth’s atmosphere.

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00:01:36,270 --> 00:01:42,280
The particles are short-lived, highly variable, and difficult to study.

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00:01:42,300 --> 00:01:47,310
[James Hansen] The big thing about Glory is it will finally make aerosol measurements

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00:01:47,330 --> 00:01:52,350
with an accuracy that allows you to determine their role in climate change.

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00:01:52,370 --> 00:01:58,380
[Judith Lean] Another big uncertainty in climate change is

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00:01:58,400 --> 00:02:03,420
:‘what is the role of the Sun’s variations.’ The Sun is our energy source.

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00:02:03,440 --> 00:02:08,420
If we turn off the Sun, we have nothing left. So, we need to know how our energy source varies.

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00:02:08,440 --> 00:02:13,430
[Narrator] A team of scientists and engineers have developed a unique mission

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00:02:13,450 --> 00:02:18,450
that addresses these complex climate forcings.

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00:02:18,460 --> 00:02:25,470
[Bryan Fafaul] Glory is a critical part of NASA’s climate research program.

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00:02:25,490 --> 00:02:31,500
Glory has two primary scientific instruments. APS, the aerosol instrument,

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00:02:31,520 --> 00:02:37,520
will help us understand the chemical properties, the physical properties,

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00:02:37,550 --> 00:02:41,560
and the global distribution of aerosols within the Earth's atmosphere.

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00:02:41,580 --> 00:02:46,590
And a solar instrument called TIM, which will continue a 28-year measurement

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00:02:46,610 --> 00:02:49,600
of the solar radiation.

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00:02:49,620 --> 00:02:53,610
[John Satrom] Those two instruments together, while they're very different missions,

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00:02:53,630 --> 00:02:57,610
both have an impact on the global climate model and climate change.

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00:02:57,630 --> 00:03:01,610
[music playing]

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00:03:01,630 --> 00:03:06,620
[Narrator] Glory's Aerosol Polarimetry Sensor, or APS, will enable researchers to monitor

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00:03:06,640 --> 00:03:11,620
aerosol particles from a space-based perspective.

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00:03:11,640 --> 00:03:14,630
[Michael Mishchenko] We need to study the distribution of particles globally,

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00:03:14,650 --> 00:03:18,640
and the only way to do that is from a satellite.

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00:03:18,660 --> 00:03:23,650

[Brian Cairns] The purpose of Glory APS is to provide a good estimate of

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00:03:23,670 --> 00:03:28,650
the amount the aerosols reflect and absorb sunlight,

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00:03:28,670 --> 00:03:34,660
so that we understand how the aerosols are affecting the climate that we live in.

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00:03:34,670 --> 00:03:40,660
[James Hansen] The data from Glory is primarily for the purpose of telling us what the

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00:03:40,680 --> 00:03:46,670
mechanisms are that force the climate models; how aerosols are changing

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00:03:46,690 --> 00:03:52,680
and how clouds are changing because of aerosols.

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00:03:52,700 --> 00:03:57,680
[Judith Lean] The second instrument will address how and why the Sun's radiation varies.

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00:03:57,700 --> 00:04:00,690
[John Satrom] The mission of the TIM instrument is to keep an eye on the Sun

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00:04:00,700 --> 00:04:04,700
and the solar irradiance level that's impacting Earth's atmosphere.

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00:04:04,720 --> 00:04:08,700
Going back to the global climate model, when you think about the Earth, one of the largest

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00:04:08,720 --> 00:04:12,710
sources of climate forcing is the Sun and the Sun's impact on the Earth.

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00:04:12,730 --> 00:04:16,720
[Judith Lean] The Total Irradiance Monitor on Glory looks at the Sun

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00:04:16,740 --> 00:04:20,730
and measures all that incoming energy.

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00:04:20,750 --> 00:04:24,730
We have recognized that we need to know and monitor the forcings

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00:04:24,750 --> 00:04:28,740
of climate change over a long period.

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00:04:28,760 --> 00:04:35,750
The TIM measurement is crucial in continuing this record of the Sun's radiation

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00:04:35,770 --> 00:04:39,760
that we now have covering almost three solar cycles.

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00:04:39,780 --> 00:04:46,770
So, Glory is poised to give us new understanding of the magnitude of those forcings

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00:04:46,780 --> 00:04:49,770
and how it effects climate.

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00:04:49,790 --> 00:04:52,790
[Narrator] Glory will join a fleet of Earth observing satellites

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00:04:52,810 --> 00:04:56,800
known as the afternoon constellation, or A-Train.

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00:04:56,820 --> 00:05:01,810
[John Satrom] Instruments that are on spacecraft are up there 24 hours a day recording data.

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00:05:01,830 --> 00:05:04,830
We get incredibly large volumes of data off of these instruments.

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00:05:04,840 --> 00:05:08,840
It gives you that ability to look at every inch of the planet, every 16 days,

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00:05:08,860 --> 00:05:12,860
and you just, you can't do that with anything on the ground.

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00:05:38,890 --> 00:05:23,870

[music playing]

64
00:05:38,910 --> 00:05:44,910
[Narrator] The launch of the Glory mission signifies a new era of climate research.

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00:05:44,930 --> 00:05:50,930
[music playing]

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00:05:50,950 --> 00:05:54,940
[Narrator] Data from Glory will help researchers understand the inner workings

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00:05:54,960 --> 00:05:58,950
of our home planet.

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00:05:58,970 --> 00:06:02,970
[John Satrom] Glory is certainly, from my perspective, a very important program.

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00:06:02,990 --> 00:06:06,980
It's going to contribute to helping to fine tune the global climate model,

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00:06:07,000 --> 00:06:11,000
and with the current emphasis on global climate change,

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00:06:11,020 --> 00:06:15,020
the climate model is where we have to start first, so Glory is a key piece to that.

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00:06:15,040 --> 00:06:21,040
[Bryan Fafaul] Glory scientists will learn valuable information about the Earth's climate,

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00:06:21,070 --> 00:06:25,060
but more importantly it's one more piece of the puzzle to help us

74
00:06:25,090 --> 00:06:29,090
understand the most important planet we know, and that's Earth.