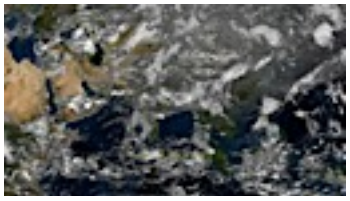
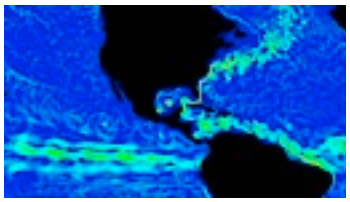
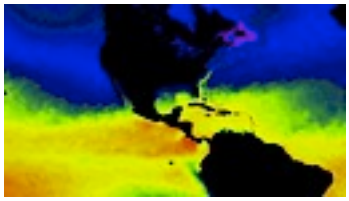
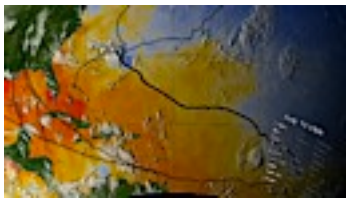
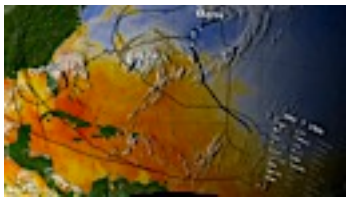
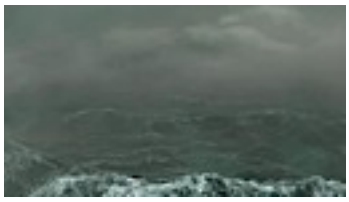
FORCE FIVE

VERSION (SUBTITLES) REVISED: JULY 26, 2013

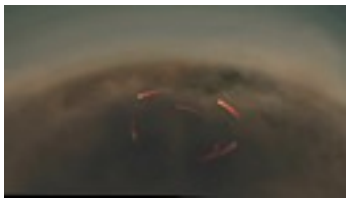
SCENE	TIME	SCRIPT
PART 1		**INTRODUCTION**
	00:06	The same forces that bring a cool breeze in spring or warm sunshine on the beach can sometimes converge into events of great scope and destructive power. Energy in our world constantly flows through natural cycles where heat, pressure, and radiation bring gradual changes in the environment. The atmosphere stores energy in clouds of suspended water droplets and releases this energy in torrents of rain and hail. Moisture-laden air, warmed by the Sun, rises through cloud layers of heavier colder air. Within the cloud, winds twist this updraft, causing a spinning vortex to form and perhaps leading to the violent energy release of a destructive tornado. For the most powerful events in the air, over the ocean, and even from the Sun, we reserve the title:
TITLES		**OPENING TITLES**
	01:00	FORCE 5 Narrator Jim Bratton Special Effects Tom Casey Score Shai Fishman
PART 2		**HURRICANES**
	01:47	Oceans cover 75% of our planet. They capture much of the solar energy reaching Earth which then warms tropical oceans and drives ocean currents.
	02:00	Ocean currents swirling around the Earth have an enormous effect on the world's weather systems. A major warm water current flows westward from Africa toward the Caribbean, spinning off ring currents of warm water into the Gulf of Mexico before flowing northward as the Gulf Stream carrying warm water along the eastern seaboard of the United States and across the Atlantic toward northern Europe.

	02:27	Temperature differences in the ocean throughout the year drive these currents. In the late summer, warm equatorial waters, shown in red, fuel storms that move westward across the Atlantic Ocean and grow into one of the largest forms of extreme weather, the hurricane.
	02:46	2005 saw more of these tropical storms in the Atlantic Basin than any year on record, with 28 storms including 4 hurricanes with winds of 250 kilometers per hour, classifying them as Force 5 storms.
	03:04	By early July, tropical storms Arlene, Bret, and Cindy had formed and made landfall. Hurricane Dennis followed, feeding on the ocean's heat energy and leaving a blue trail of cool water in the Gulf.
	03:18	Emily, first of the Force 5 storms, provided little cooling for the superheated Gulf of Mexico. Tropical storms Franklin, Gurt, and Harvey never reached hurricane strength or threatened land. While they were moving north, Irene formed off the coast of Africa and headed west ultimately caught by the same steering currents as Franklin and Harvey.
	03:49	Meanwhile the Gulf was growing warmer and warmer, shown in deep red hues. Soon a monster storm formed north of Cuba and headed for the superheated waters. Hurricane Katrina drew enough energy from the ocean to become a Force 5 killer aimed for New Orleans.
	04:13	Four hurricanes followed, turning harmlessly into the Atlantic while the gulf grew ever warmer. Soon the season's third Force 5 hurricane, Rita, followed the path of Katrina, using the Gulf's energy to grow into an enormous storm, headed for east Texas.
	04:34	But the warm ocean of 2005 could fuel even more storms. The paths of Stan and Tammy were short, providing little time for them to strengthen, but, perhaps, setting the stage for Wilma, the fourth and strongest of the Force 5 Hurricanes, Wilma had the lowest central pressure of any hurricane as it battered Yucatan and then headed for Florida and the open Atlantic. Six more storms followed, producing the longest and most intense hurricane season on record.

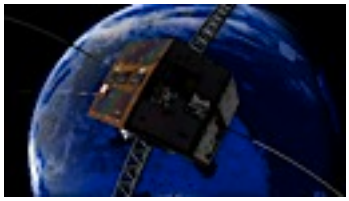
	05:12	As devastating as 2005 was, it pales in comparison to September 8th, 1900 in Galveston Texas. Galveston was the bustling port city importing goods to the entire Southwestern United States. It was the financial center of Texas, with a population of over 37,000 including many recent immigrants, with very little hurricane experience.
	05:36	Unknown to the residents and even the staff of the Weather Bureau, a powerful hurricane was churning in the Gulf of Mexico, moving slowly westward in the Gulf's superheated waters, building its power and size to become an incredible monster.
	05:51	At dawn high slow swells rolled onto the beach, but the weather bureau had received no warnings of a hurricane nearby and failed to recognize this sign of the approaching storm. By midmorning rain started to fall. The hurricane was only 50 miles off shore pushing huge waves against the coastline. Water began flowing into low-lying streets. Kids played in the water and children sang.
	06:21	By noon, gale force winds and mammoth waves covered the bridge to the mainland and crushed bathhouses on the beach. By 2:30 the weather bureau finally raised the hurricane flag, but it was much too late for the island's residents who had no place to go.
	06:44	The city had no power, no communications, and no bridges to safety. Its residents were all alone.
	06:58	Just after 6 pm, the storm surge hit its peak. The sea rose 4 feet in 4 seconds. Houses collapsed, corpses littered the water, and survivors clung to floating debris through the drenching rain, howling wind, and total darkness.
	07:20	Sunday, September 9th, brought a brilliant sunrise with a clear blue sky and a tranquil Gulf of Mexico. But Galveston lay in ruins. Survivors could hear cries of people buried too deep to be saved. The dead were everywhere ñ over 6,000 had perished. Bodies were burned where they were found and funeral pyres glowed all over the island.
	07:46	Thomas Edison sent his latest invention, the movie camera, to document the destruction. Clara Barton of the Red Cross arrived and focused national attention on the disaster. Many people left the island. But others stayed to rebuild and create a sea wall so a hurricane could never destroy their city again.

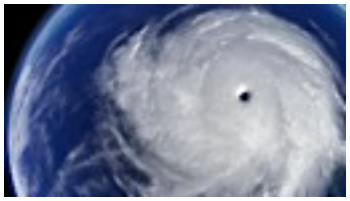
	08:07	In 2008, Galveston faced another great storm, Hurricane Ike, one of the largest hurricanes ever observed in the Atlantic basin. But now there were satellites and aircraft to fly through the storm.
	08:25	Deafened by the engines' roar, pilots calmly flew the plane toward the eye wall. A gray cloud loomed 50,000 feet into the sky, and the plane was roaring into it.
	08:36	These hurricane scouts had to cross the gigantic storm to measure its size and power. The eye wall buffeted the plane with howling winds, blinding rain, violent updrafts and downdrafts.
	08:49	Ten thousand feet below, warm Gulf waters nourished the growing storm.
	08:54	Using forward particle sampling probes, the plane gathered data on wind speed, barometric pressure and temperature.
	09:02	A hurricane hunter plane resembles a high-tech lab. Metal grids on the floor offer secure places to stash equipment, wires snake everywhere, and the armless seats offer little to grab onto when the plane starts bucking and tilting in the storm. Storms are most dangerous as they build or break apart when a potentially deadly microburst of wind and huge up-drafts and down-drafts can threaten the plane.
	09:36	The flight director, a meteorologist, monitored the storm while on board the plane. This plane and crew were on a critical mission to provide information that satellites and radar can't collect, with instruments and probes controlled on site by a human eye and brain.

	09:52	The crew deployed a downward atmospheric profiling probe into the eye of the storm, transmit data from regions too low and risky for the hurricane hunting aircraft.
	10:08	All ships, including massive oil tankers, rushed to find cover from the enormous storm. Fierce winds had set most of the Gulf of Mexico into motion and created a very destructive storm surge.
	10:25	Drones flew just above the ocean to monitor the storm's fury at the ocean surface.
	10:32	Refineries, critical for the nation's energy production, had prepared for the worst. On September 13th, Hurricane Ike finally made landfall on Galveston, with a 15-foot high mound of water pushed ashore by the storm's winds.
	10:53	Debris and loose boats littered the island. Many homes in the path of the surge were torn to shreds. Piers and structures extending into the Gulf were damaged or destroyed. But the seawall, built after the 1900 hurricane, held, protecting the city over a century later.
PART 3		**TORNADOES**
	11:22	Thunderstorms develop between the Rocky and Appalachian Mountains, from Iowa to the Gulf of Mexico. These turbulent giants are created when warm humid air from the Gulf collides with cool dry air from the Rockies. The vast majority of all the world's tornadoes develop along the front where these air masses meet.
	11:42	As a thunderstorm grows, the condensed moisture forms a thunderhead cloud that can rise 50,000 feet into the sky. Within this thunderhead, a region of spinning air forms and stretches vertically.

	11:56	When this area of rotation lowers below the storm, it becomes a wall cloud. A violent and unpredictable tornado funnel can form in this wall cloud and drop to the ground.
	12:10	The United States averages 1200 tornadoes a year. Tornadoes are rated on the Enhanced Fujita scale, with the most powerful twisters classified as EF-5. In a Force 5 storm, strongly built houses are blown away and cars become missiles picked up and tossed out of the vortex.
	12:34	The warning signs of an impending tornado include a dark greenish sky and a thunderstorm. By using Doppler radar and orbiting satellites, we can predict tornado conditions.
	12:46	An anvil cloud, a lowering wall cloud and even hail precede the twister's appearance.
	12:52	*W5TAR, Storm Spotter Mobile 3, this is SKYWARN base WA5QXE. Doppler radar indicates a super-cell near your vehicle's GPS coordinates. Copy?*
	13:08	*Skywarn base, this is W5TAR. Yes, I see that wall cloud!* **BASE**: *Roger*
	13:27	*Whoa! Funnel touchdown dead ahead of us ñ please relay* **BASE**: *Roger, Mobile 3*
	13:38	*Tornado crossing US 62, 1 mile north of 277, moving due East.* **BASE**: *Copy the information*

	13:53	Wow, it is growing, 20 meters wide now, with big debris cloud. **BASE**: *Copy the size of the debris cloud*
	14:13	*Skywarn base, The tornado is now moving southeast.* **BASE**: *Roger, will report the path change*
	15:04	*W5TAR, your storm spotting saved many lives. Thanks and 73.*
PART 4		**SOLAR STORMS**
	15:16	Some powerful events originating in space easily dwarf phenomena on the Earth's surface. Our distant looks small and calm during a total solar eclipse. But its glowing corona surrounding the dark Moon disk hints of the violence below.
	15:33	The Sun's surface is a seething cauldron of gas with energy eruptions so tremendous that they affect us on Earth. The 's energy escapes as radiation and sometimes as a solar flare.
	15:53	A solar flare erupts from a sunspot active region and produces dangerous quantities of energetic particles and high-energy radiation. The most deadly flares create a Force 5 geomagnetic storm. The Earth's atmosphere and magnetic field deflect and absorb most of the harmful rays, thus protecting life on the Earth's surface.
	16:17	Missions like Cluster and the Magnetospheric Multiscale, measure dynamic changes in the Earth's magnetic field, which are dramatic after solar flares.

	16:30	Solar observatories in space such as TRACE, SOHO and SDO warn us of solar flares with possible solar storms coming toward Earth in the solar wind. The ACE satellite monitors particles from solar eruptions which become trapped in Earth's magnetic field.
	16:49	This IMAGE spacecraft made pictures of these particles and used its long booms to monitor particles using radio waves.
	16:59	Data from these satellites helps us predict flare eruptions and coronal mass ejections from the . Other satellites show us how a force 5 solar event can affect Earth's magnetic field, upper atmosphere, and even power grids on the surface below.
	17:26	A solar flare is often accompanied by a coronal mass ejection, spewing out over a million tons of solar particles toward Earth. The coronal mass ejection, or CME, causes geomagnetic storms in the Earth's atmosphere.
	18:26	A CME reaches Earth just a few days after the flare. If you could see Earth's magnetic field, the field lines would look like spaghetti, some strings attached to the Earth at both ends and some extending away from the Earth.
	18:40	The CME blast hammers our planet's magnetic cocoon. The field shakes violently and is sometimes forced inward, exposing satellites to harm. Energized particles trapped in the field can disable satellite electronics and create disturbances on the power grid that may cause blackouts as well as the beautiful, twisting auroral lights encircling Earth's magnetic poles.
PART 5		**CONCLUSION**
	19:17	The forces of nature make our lives possible and our world interesting. They trap energy all around us: in warm ocean currents, in moving air masses, and in the twisting magnetic fields of the and Earth. We have discovered that the most extreme of natural catastrophes are but periodic peaks in the ever-flowing path of natural forces.

	19:43	Over years of observation and experimentation, we have developed ways of viewing, measuring, and sometimes even predicting nature's next move.
	19:53	Someday we will leave Earth's cradle to explore our solar system. Although we leave behind the tornadoes and hurricanes of Earth's atmosphere, the Sun's Force 5 eruptions still threaten us.
	20:07	With skill and a bit of luck, our science, technology, and vigilance will keep us ready wherever we journey, when nature once again goes Force Five.
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Photography		Gary Young
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