

SPECTACULAR SCIENCE DAY AT TED TURNER'S RANCH

where kids become storm chasers/hurricane hunters

Abstract

Middle School Kids of New Mexico will get to be a part of the storm chasing mission. They will assume the roles of little scientists and plan the flight into tropical storm Cindy with our experts and the pilot crew. They will decide where to fly and in which pattern, handle the instruments and analyze the data from the mission. The storm that we will recreate at Ted Turner's ranch was the first storm of the 2017 hurricane season, followed by Harvey and Irma. Using real observations and images from Cindy, we will recreate a day full of excitement and cool science. We will use a helicopter and a hot air balloon instead of the research plan, a bit of imagination on where the most dangerous clouds are, while everything else will mimic the real field project mission from June 2017 and our flight into Cindy.

Timetable (Fall/Spring 2018)

TIME	EVENT
9-10	Scientific mission planning
10-10:30	Pilot briefing
10:30-11:30	Loading the dropsondes/getting familiar with the helicopter and balloon
11:30	Take off
11:30-12:15	Flight mission
12:30	Debriefing
13-14	Lunch (science games)
14	Searching for sondes (hide and seek)
15-16	Launching the radiosondes upward

SPECTACULAR SCIENCE DAY AT TED TURNER'S RANCH

We would like to offer a unique experience to the kids from middle schools in T or C, Socorro and Las Cruces. For one day the kids would literally become storm chasers or hurricane hunters which is a job that I get to do for my living.



There would be 60 - 100 kids divided into groups of 20. The first step of every flight mission is to come up with a plan of where to fly. Each group would participate in planning. The kids would take up the roles of various scientists and with our experts they would discuss various options. They would use the radar and satellite images as well as numerical weather model

outputs provided by us from the flight missions that took place this summer over the Gulf of Mexico and the Caribbean (NASA CPEX project in which my team participated for 2 months). In this way, after a bit of background, the kids would be brainstorming a real puzzle that we faced when we had to fly into the first tropical storm of the 2017 hurricane season, Cindy. The kids would not lack for motivation as Cindy was followed by Harvey and Irma which brought devastating pictures to the TVs in their homes. Guided by our experts, the kids or our little scientists, would decide on a flight pattern and its location. They would also need to decide how many dropsondes to use and where. Dropsondes are the most important instrument that we have on a plane. They look like little tubes and are very light, but inside they have sensors that measure temperature, pressure, humidity and winds as the dropsonde is falling down from the plane. The dropsonde receiver is on the plane and one gets to see the data collected by a dropsonde in real-time. Some dropsondes have a little parachute, while others don't need it. We will use the dropsondes without the parachute, the same ones that we used in NASA project this summer. The kids will have an opportunity to handle them as the flight mission of the day approaches. Each dropsonde costs \$1000 dollars and when dropped into the ocean it is lost forever so it is very important to make a good decision on where and when to drop them. The flight itself takes place a few hours after the scientific discussion which will lead to a bit of surprise for our little scientists because the storms and hurricanes often have a mind of their own. They will then have to think quickly and alter their plans.

As on the field project, the scientific discussion will be followed by the pilot crew briefing. This is always a very important part of the mission as safety of the souls on board depends on clear understanding of what can be expected in the air while flying through the storms. Our research planes are equipped with scientific instruments such as radars, lidars, etc., and they look like a lab. It is very important to be aware of the surroundings, have the headphones on at all times, and to listen to the pilot when things get tricky. The commercial planes do everything they can to avoid the storms and we will be planning to fly into them! Our little scientists will learn that it is imperative to sit down and buckle up when the pilot says so (the scientists don't like that part because they have work to do around their instruments). After all the security measures are discussed, the names of scientists participating are called out, the gear is gathered and we go on a flight. Doors close 30 minutes after the briefing.

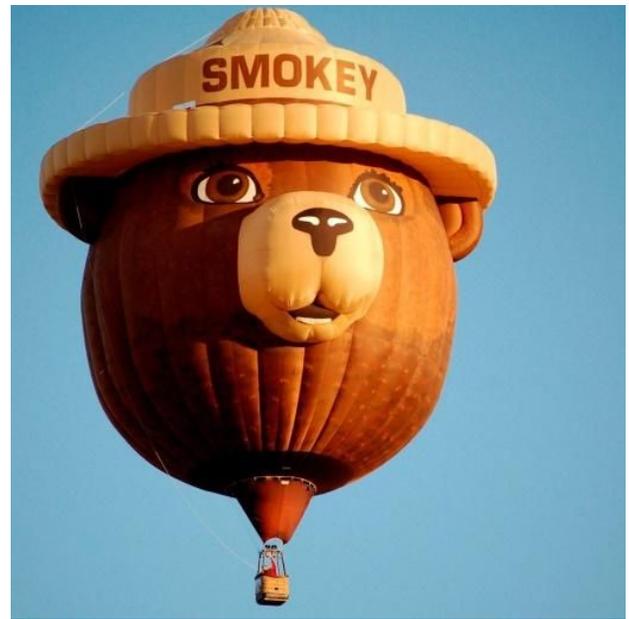


Inside the NASA airplane, summer 2017

Instead of the research plane, we will use a helicopter and a hot air balloon. Both will be equipped with a dropsonde receiver and the kids will take the dropsondes on board. They will put their initials on the dropsondes and use their imagination to feel like they were on board of the plane/helicopter together with their dropsonde. We will be in contact with the helicopter and the hot air balloon, have our air space mimic the Gulf of Mexico and the weather situation that was discussed in the morning. After the “plane” approaches the expected storm system through satellite and radar images as well as the photos from the NASA



The Black Hawk helicopter and Smokey the Bear hot-air balloon which will be used to launch dropsondes



project the little scientists will see that the storm has moved or matured and will have to alter the flight plan a bit. They will also be calling out the time to drop the sonde. First they will need permission from the pilot who needs to clear that the air space underneath has no air traffic. Afterwards they will give an order and our experts on the helicopter and a balloon will drop the sonde. We plan on dropping 20 sondes that have GPS so we will know their location after the fall (the kids will not know the exact location). After lunch the kids will be able to relax and wind down by playing hide and seek with the sondes that have their initials on as those are the ones that they will need to track through the mission.

The flight mission is always followed by a debriefing in which our little scientists will summarize the mission and things that went wrong, what can be improved as well as what went right. We will look at the data that we collected and compare it with the data collected in the flight to tropical storm Cindy, the storm that we recreated at Ted Turner's ranch. The kids will be able to take the data with them as well as numerous little brochures that will explain the science behind their experience of that day.

The retrieved sondes will at the end of the day be launched upward with a big balloon and the kids will be able to see how we gather data vertically if we have solid ground from which to launch the sondes.



Launching radiosondes upwards

Expert team:

- **Dr. Zeljka Fuchs**, director of the Climate and Weather Center, Research Faculty, New Mexico Tech (*flew in NASA CPEX and other field projects, general manager of the NSF field project OTREC 2019*)
- **Dr. David J. Raymond**, professor emeritus, Climate and Weather Center, Physics Department, New Mexico Tech (*flew in NASA CPEX and other field projects, the scientific manager of NSF field project OTREC 2019*)
- **Mark C. Beaubien**, Sr. Engineer/GM, Yankee Environmental Systems, 101 Industrial Blvd, Turners Falls, MA 01376
- **Dr. Carlos Lopez**, assistant professor, Physics Department, NMT (*flew in NASA CPEX*)
- **Dr. Stipo Sentic**, postdoc, Climate and Weather Center, New Mexico Tech
- **Jose Martinez Claros**, graduate student (*flew in NASA CPEX*)
- **undergraduate students**



**Dr. Zeljka Fuchs and Dr. David J. Raymond
inflight, NASA CPEX 2017**

Pilot crew (6-10 people)



In-flight pilot crew

Event organizer: Dr. Zeljka Fuchs, director of the Climate and Weather Center, Research Faculty, New Mexico Tech (*flew in NASA CPEX and other field projects, general manager of the NSF field project OTREC 2019*)



Dr. Zeljka Fuchs, before flight into storm CINDY, NASA CPEX 2017

About the Climate and Water Center

The Climate and Water Consortium features scientists working on cutting-edge research and applying it to the real world. The Consortium is an innovative problem-solving center for interdisciplinary research and outreach; bridging physics, atmospheric physics, engineering, hydrology, geophysics, chemistry, applied math, economics, computer science, and education; a way to use science to solve overarching problems of our society, in particular applied to weather prediction, climate change, water management, and high technology.

<https://cwc.nmt.edu>

From the press

Zeljka Fuchs and David Raymond plan to get close to hurricane breeding grounds in the tropical East Pacific Ocean and Caribbean Sea. The hope is to improve weather predictions around the world.

—*San Francisco Chronicle*

“If we don’t have the data, we cannot determine if our physics is correct,” Fuchs said; “If we don’t understand the physical processes that go into the model, the forecast will suffer.”

—*El Defensor Chieftain*



“This research will provide us with models to help us do better forecasting,” said the school’s Vice President of Research Dr. Van Romero, who added that the work will also provide practical applications for New Mexico agriculture producers.

—*Albuquerque Journal*

Raymond said, “Tropical Eastern Pacific Ocean is the ideal place to study rain. Understanding convection in the tropics is essential to making better weather forecasts over the entire globe, including here in New Mexico.”

—*El Defensor Chieftain*

Project impact

We wish to show kids of ages 9-11 that science can be fun. This age is when we, the scientists, lose most of the kids as they start disliking math and science. We wish to motivate them by showing a real cool example of what they can become if they manage to stick to science through their education. We will show them what their future job can look like. In particular, girls at that age start questioning their ability to become scientists or engineers. Perhaps my story (as a kid I was discouraged from dreaming about “man” jobs) will help girls to see this differently.

Scientifically this will be the first time ever that the dropsondes are launched from a helicopter or hot air balloon. The scientist part of us is very excited to make it happen, while the human part of us is excited to inspire and motivate new generations as well as raise awareness of the dangers of extreme weather that we will be facing more in the future.

We work hard on promoting science to the public. A documentary film of a day when kids become little scientists and storm chasers would be an excellent step in that direction as it is appealing and it has never been done before! Right media coverage of the ‘Spectacular Science Day at Ted Turner’s ranch’ could be used for future outreach and community projects by both, Ted Turner Expeditions and NMT. We hope to work together with Ted Turner Expeditions in securing as much media as possible for this event, preferably TV stations with their own helicopters so that each phase of the project can be filmed. Perhaps even the National Geographic would be interested in this event!

