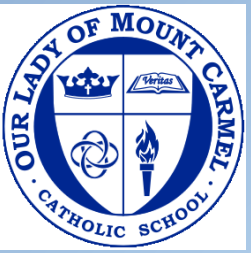
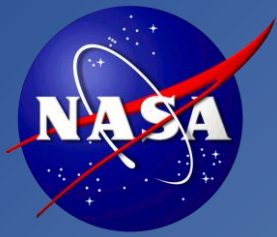


A Teacher's Journey to the GLOBE International Virtual Science Symposium

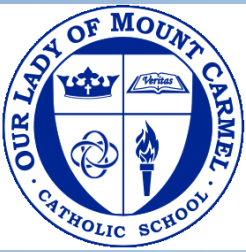


Angie Rizzi – arizzi@olmc-school.com

**Our Lady of Mount Carmel School,
Newport News, VA**

**Dr. Margaret Pippin – NASA Langley
Research Center**





Our Lady of Mount Carmel School

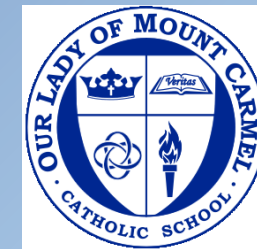
Pre-K through Grade 8

Catholic School (no SOLs)

Roughly 300 students

Large outdoor space (no water source)

**Currently building outdoor classroom and grade
level gardens**



LEARNiNg GLOBE

2014-2015
NASA
LEARN

2014
GLOBE in
Middle
School

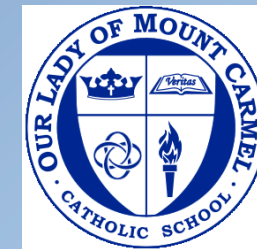
2016
GLOBE
Schoolwide
plan

First Air
Quality
Field
Campaign



NASA LEARN 2014-2015





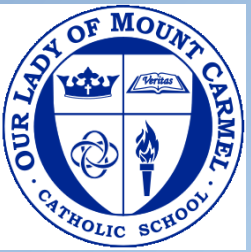
LEARNiNg GLOBE

2014-2015
NASA
LEARN

2014
GLOBE in
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School

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GLOBE
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plan

First Air
Quality
Field
Campaign

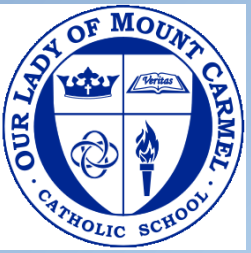


Middle School 2014

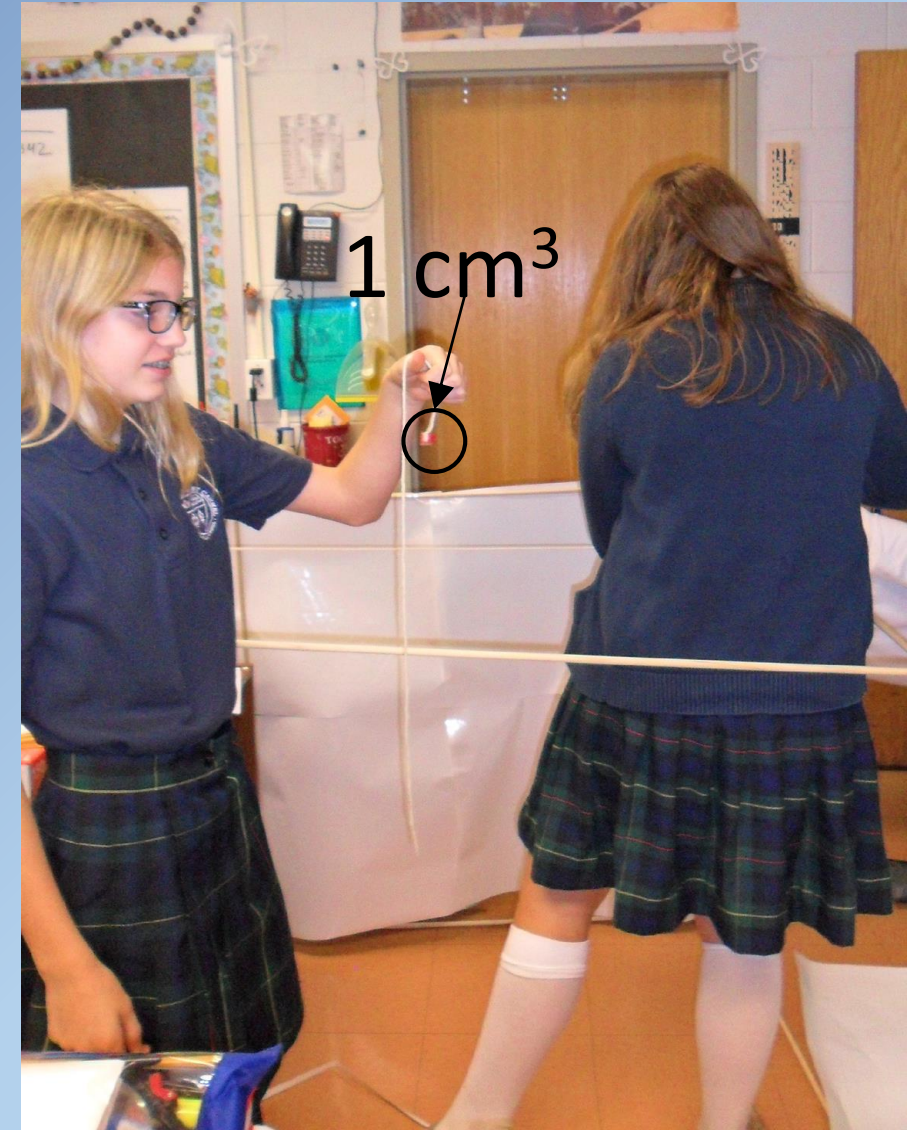
- Grades 6-8
- Measurements
 - [GLOBE Clouds](#)
 - Aerosol Optical Thickness (AOT)
- Support with learning activities

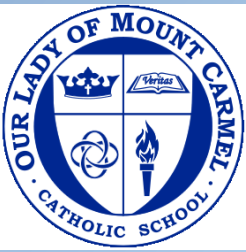


* Original Artwork- Jenn Glaser and Russanne Low,
ScribeArts for the GLOBE Program



Learning Activities (ppmv in Atmosphere - CO₂) 1,000,000 cm³

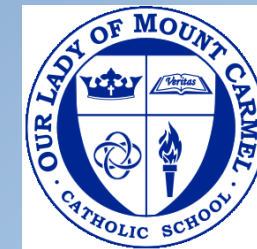




Learning Activities

- Be Creative
- Estimation Demonstration
 - Can be used in a variety of contexts
 - Practice with estimating
 - Comfort with uncertainty
 - Data entry categories are easier





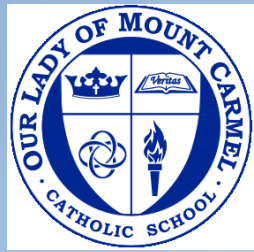
LEARNiNg GLOBE

2014-2015
NASA
LEARN

2014
GLOBE in
Middle
School

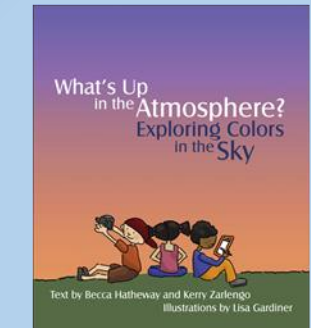
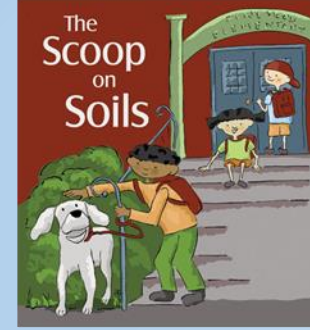
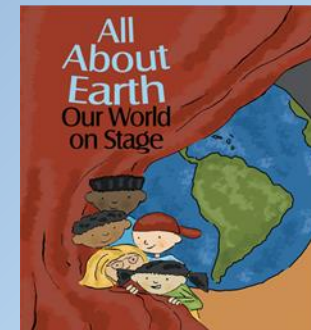
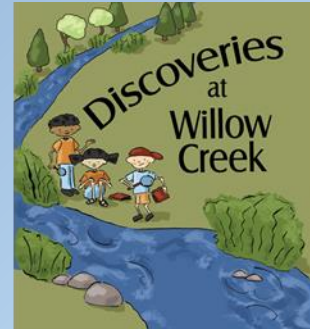
2016
GLOBE
Schoolwide
plan

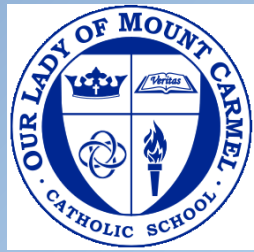
First Air
Quality
Field
Campaign



Elementary GLOBE

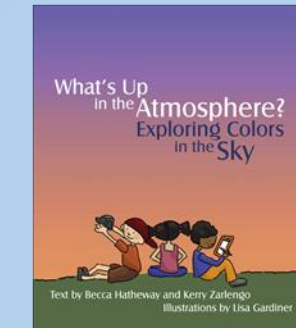
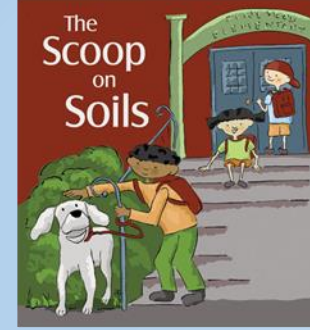
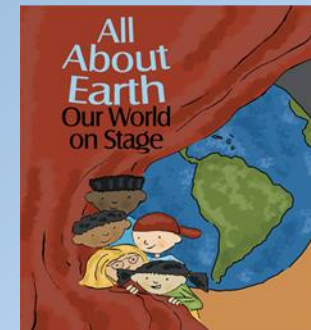
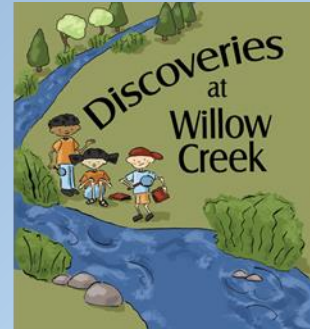
- Elementary GLOBE Vertical Alignment
 - Pre-K and Kindergarten - Mystery of the Missing Hummingbirds
 - 1 - Discoveries at Willow Creek
 - 2 - All About Earth
 - 3 - The Scoop on Soils

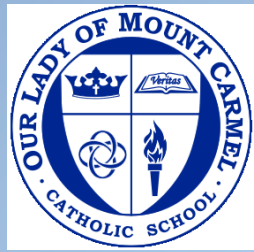




Elementary GLOBE

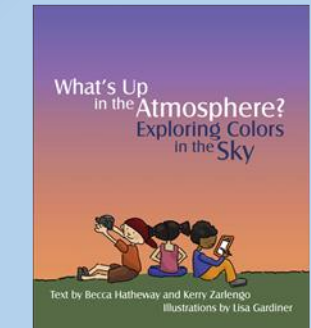
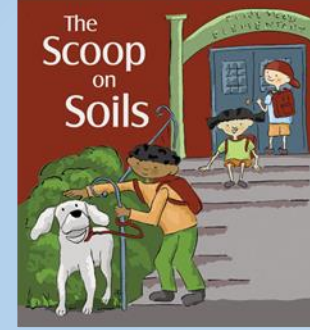
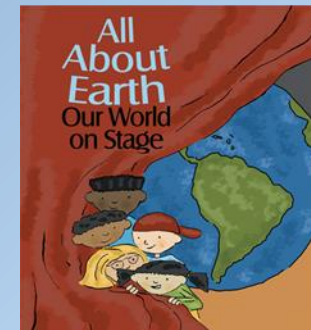
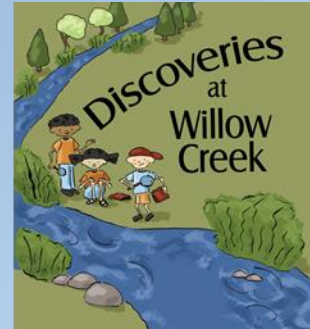
- Elementary GLOBE Vertical Alignment
 - 4 - What's Up in the Atmosphere?
 - 5 - Do You Know that Clouds Have Names?

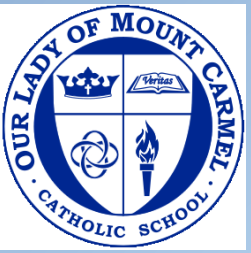
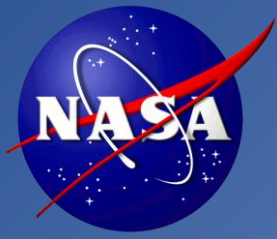




Elementary GLOBE

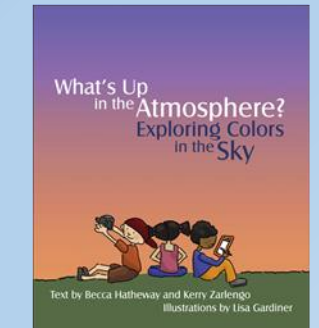
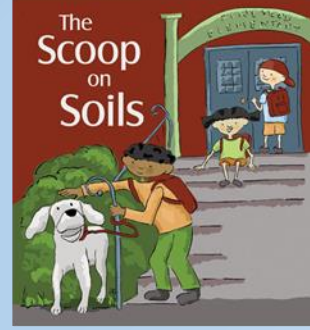
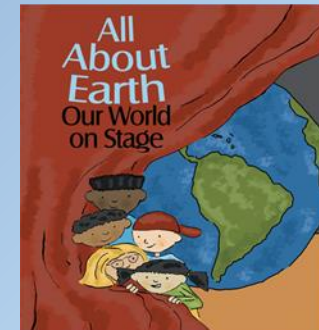
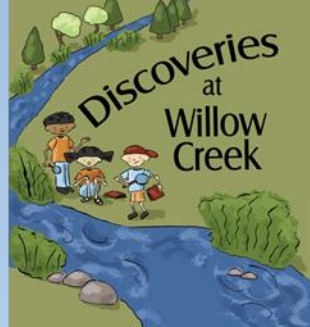
- Sample Protocol Vertical Alignment
 - Pre-K/K – Sky Color and Clouds
 - 1 – Surface Temperature
 - 2 – Max/Min Current Temperature
 - 3 – Clouds and Precipitation

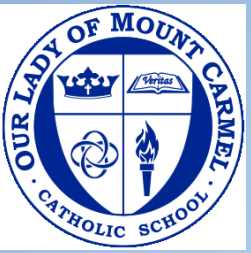




Elementary GLOBE

- Sample Protocol Vertical Alignment
 - 4 – Relative Humidity
 - 5 – Precipitation pH and Barometric Pressure



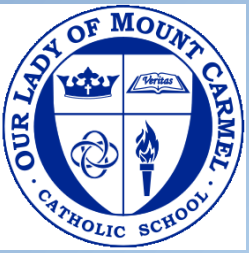


Middle School

- Field Campaigns and collaboration give meaning and context for measurements
 - Student Air Quality
 - [GLOBE Clouds](#)
- Select learning activities and protocols to align with curriculum

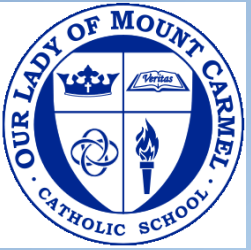
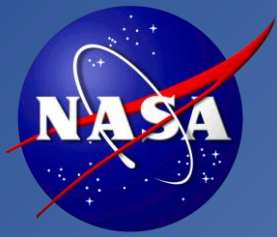


* Original Artwork- Jenn Glaser and Russanne Low, ScribeArts for the GLOBE Program



Sample Learning Activities by Sphere

- Physical Science
 - Compare Site to One in Another Area – **Earth Systems**
 - Building a Thermometer – **Atmosphere**
 - Investigating Leaf Pigments – **Biosphere**
 - The Data Game – **Pedosphere**
 - The pH Game - **Hydrosphere**



Air Quality Field Campaigns

Spring 2016

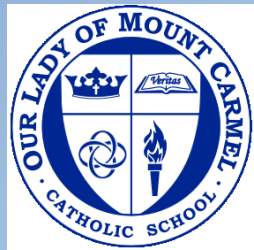
- Student Training Clouds and Aerosols
- Borrowed Calitoo Instrument from NASA
- Little Data Entry – Interesting Finding

Fall 2016
Spring 2017

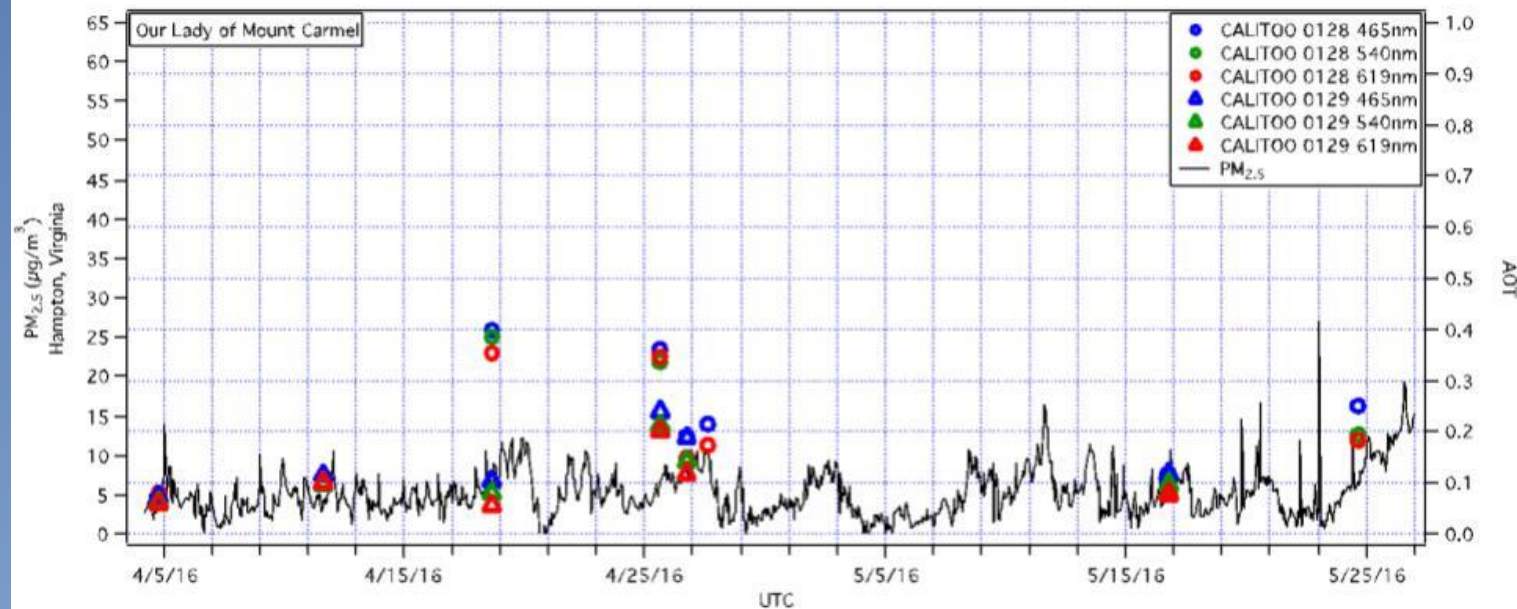
- Continued Training and Purchased Calitoo
- Increased Data Collection and Entry
- Collaboration with another school

Fall 2017
Spring 2018

- Student Expert – Significant Data
- Geoscience High School Class Projects
- IVSS



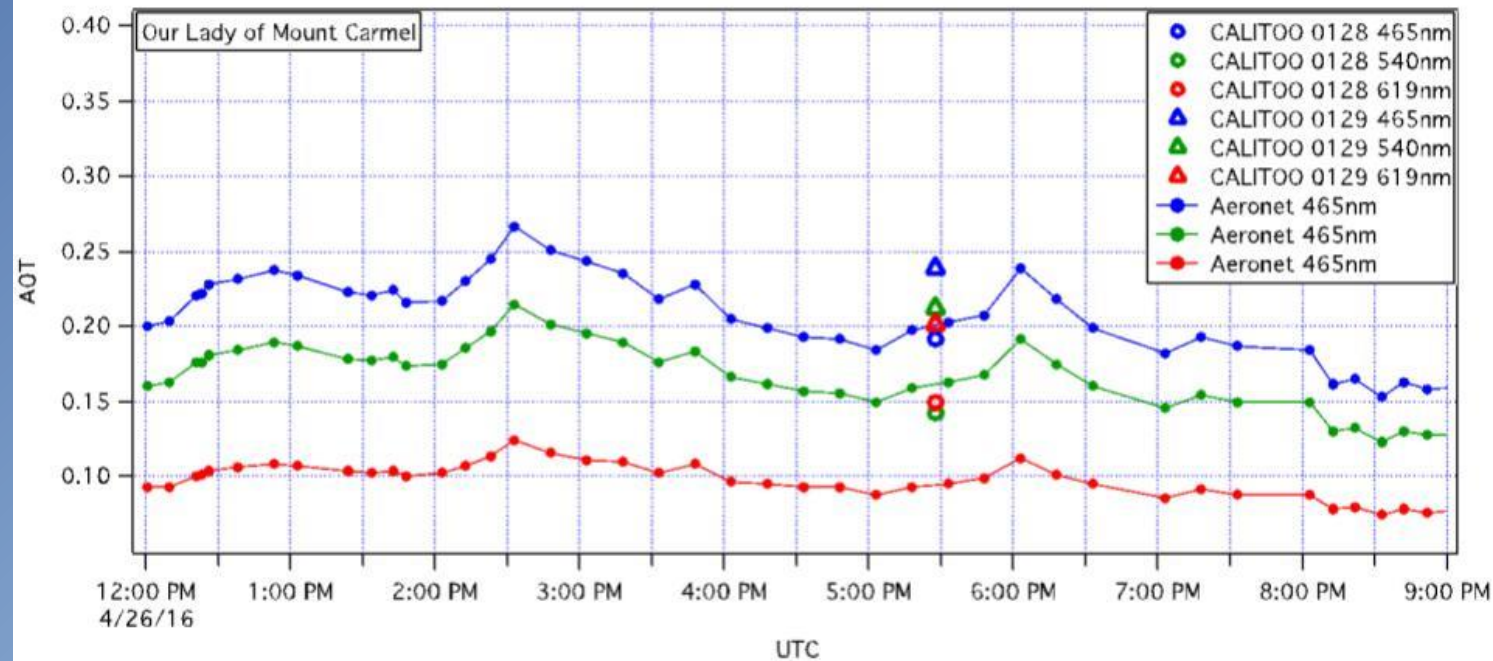
Our Lady of Mount Carmel



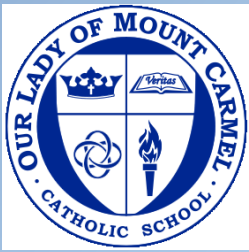
- Particulate matter 2.5 (microns and smaller) data is in-situ from a close DEQ site To get PM_{2.5} data check out: <http://vadeq.tx.sutron.com/>
- The colored circles are the student collected air column AOT data



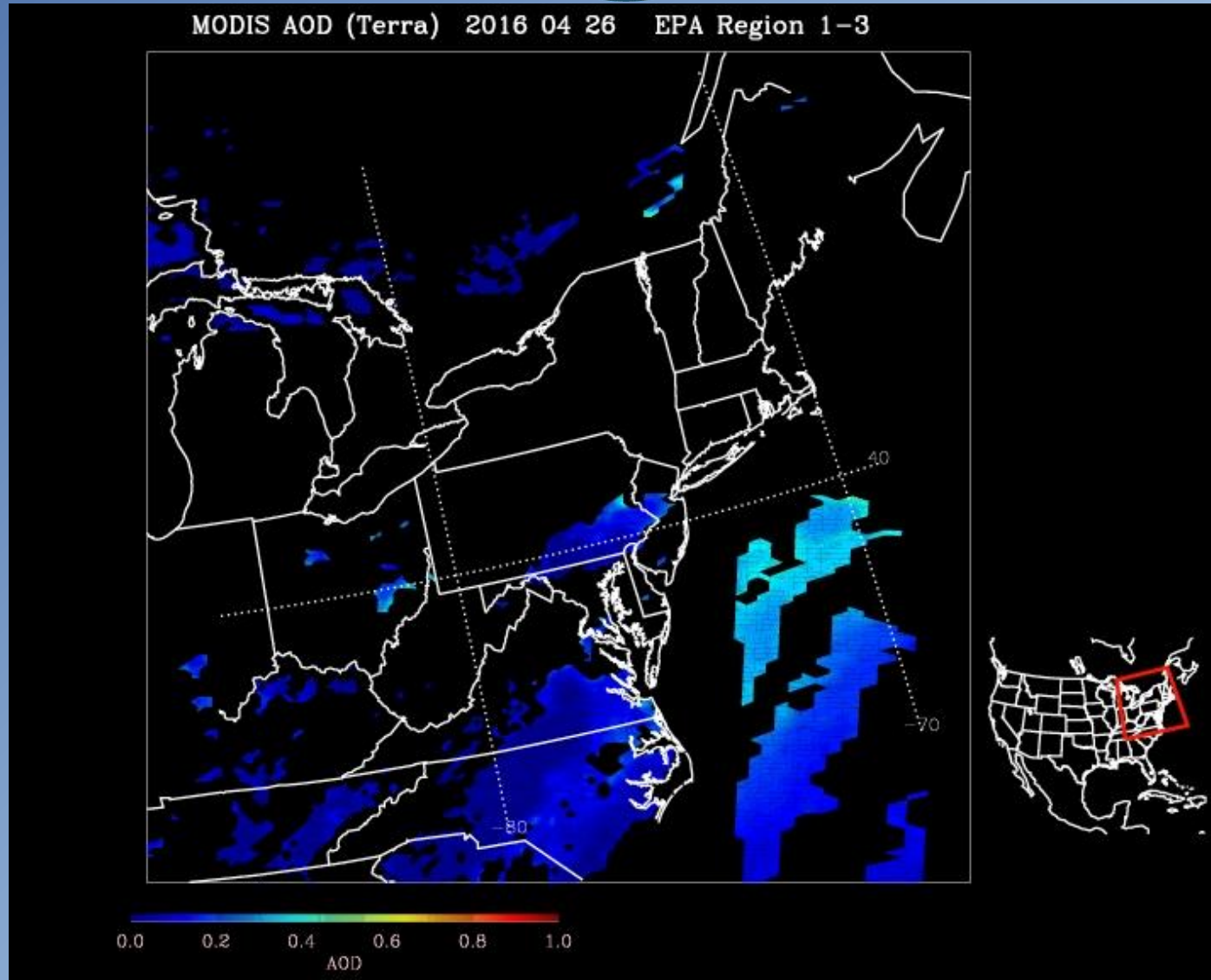
Our Lady of Mount Carmel

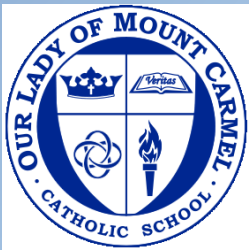


- AERONET is a scientific grade instrument takes column aerosol data just like your students.
- Data is available at : <http://aeronet.gsfc.nasa.gov/>



Our Lady of Mount Carmel - MODIS





Air Quality Field Campaigns

Spring 2016

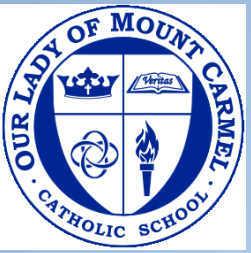
- Student Training Clouds and Aerosols
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- Little Data Entry – Interesting Finding

Fall 2016
Spring 2017

- Continued Training and Purchased Calitoo
- Increased Data Collection and Entry
- Collaboration with another school

Fall 2017
Spring 2018

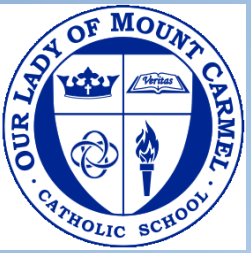
- Student Expert – Significant Data
- Geoscience High School Class Projects
- IVSS



What did OLMC School get out of GLOBE in 2016-2017?

- Used scientific instruments
- Collaborated with other schools
- Actively engaged in measurements
- Trained each other to use instruments

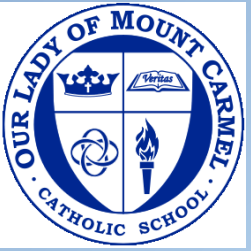
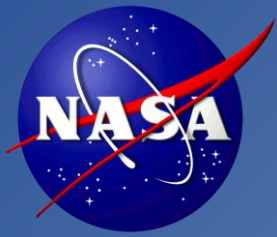




What did OLMC School get out of GLOBE projects in 2016-2017?

- Used the GLOBE database
- Maintained a consistent lab notebook
- Feedback from NASA scientists GLOBE Clouds
- Broadened cultural awareness



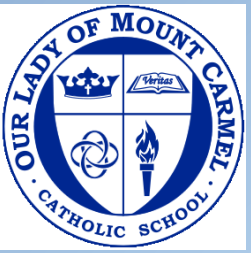
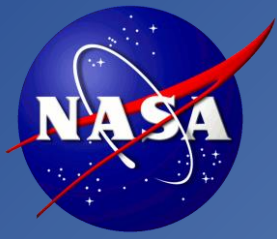


Collaboration



“Schools Work
Together to
Make Science
Twice the Fun”

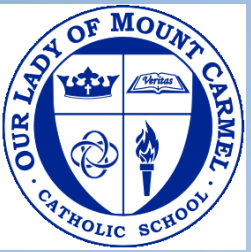
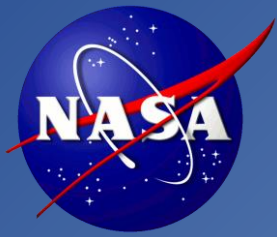
Catholic
Virginian
5/18/17



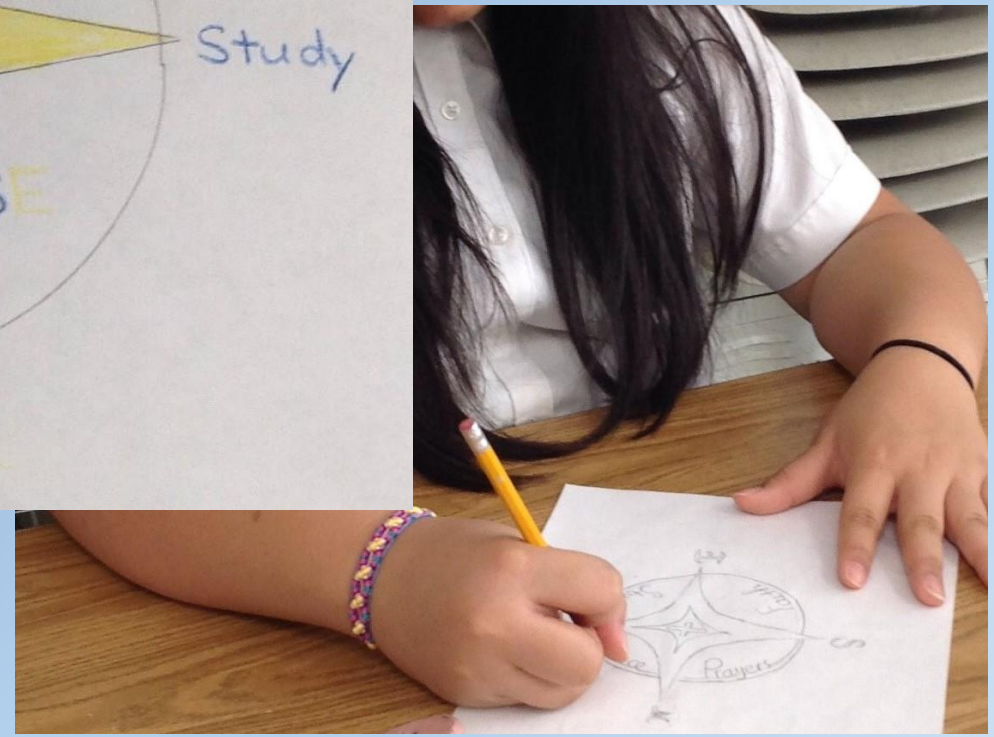
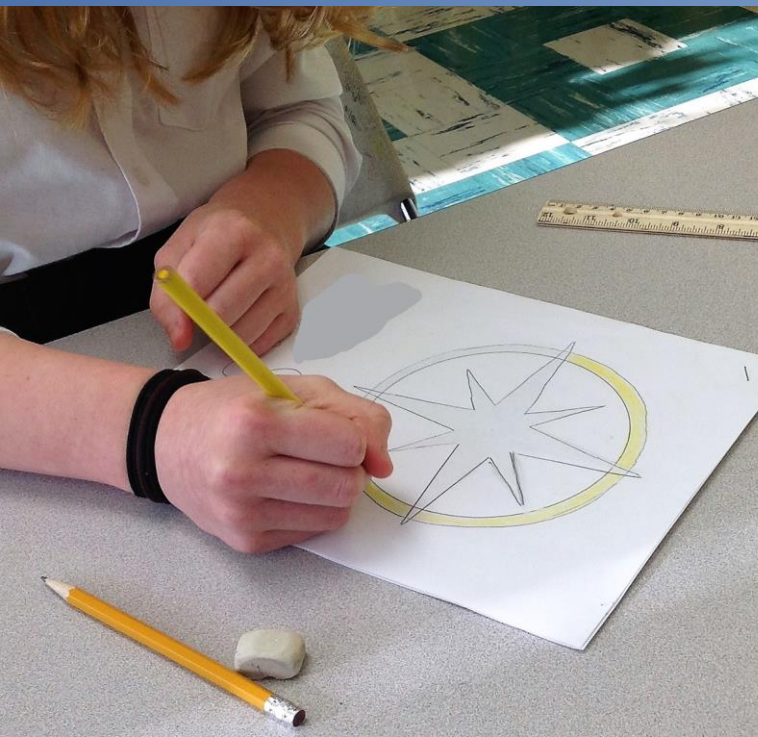
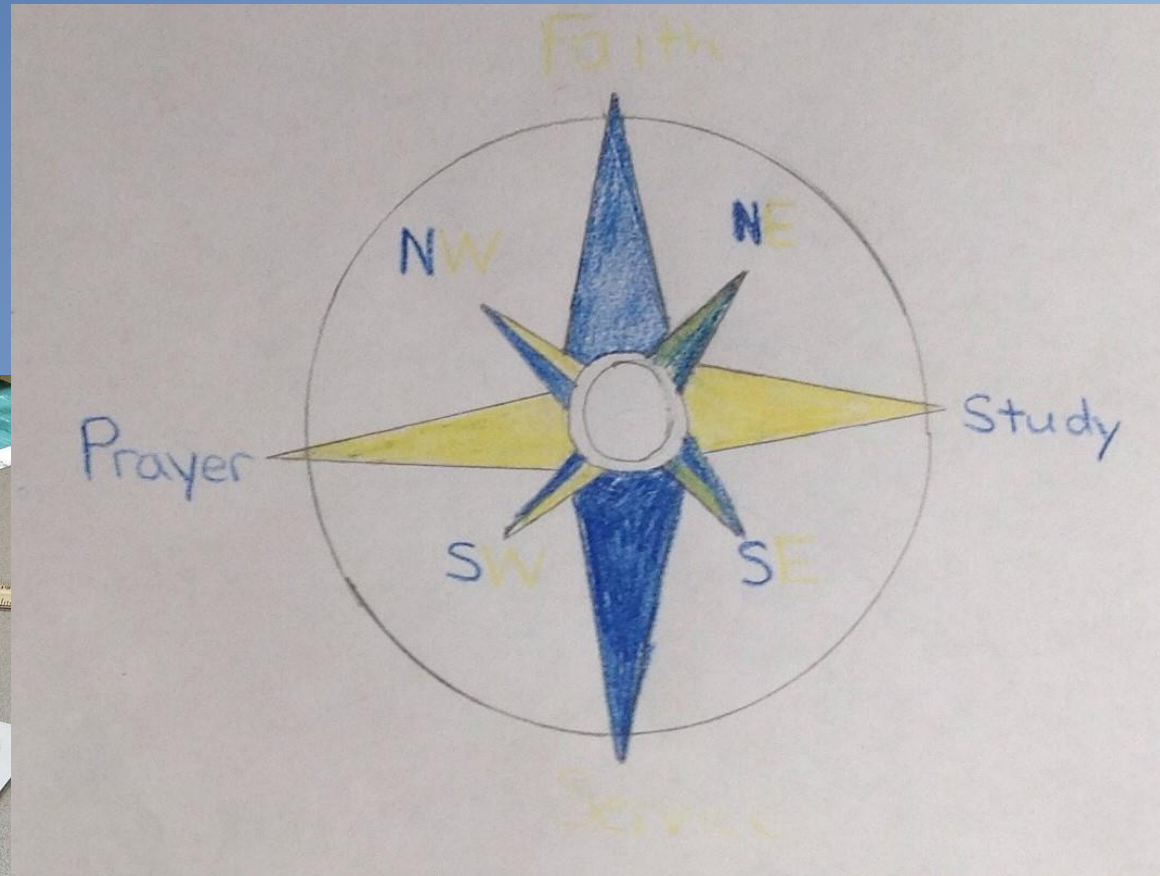
Cultural Awareness

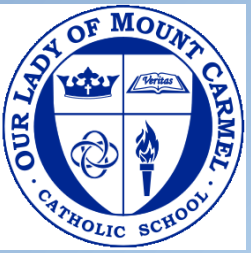
- Walk-a-thon carrying gallons of water to raise money for people lacking access to safe water
 - Handwashing Station
 - Family wash kit
 - Water Pump tools and training
 - Community Latrine





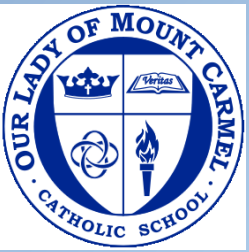
Creativity





Cross-Curricular Implementation

- Uses GLOBE in classes other than science
 - Language Arts
 - Art
 - Math
 - Library



Air Quality Field Campaigns

Spring 2016

- Student Training Clouds and Aerosols
- Borrowed Calitoo Instrument from NASA
- Little Data Entry – Interesting Finding

Fall 2016
Spring 2017

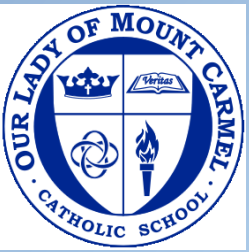
- Continued Training and Purchased Calitoo
- Increased Data Collection and Entry
- Collaboration with another school

Fall 2017
Spring 2018

- Student Expert – Significant Data
- Geoscience High School Class Projects
- IVSS

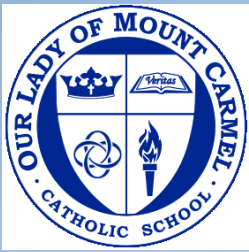
2017 Kick Off - North American Eclipse





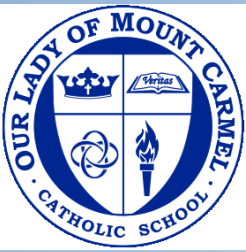
GLOBE Observer





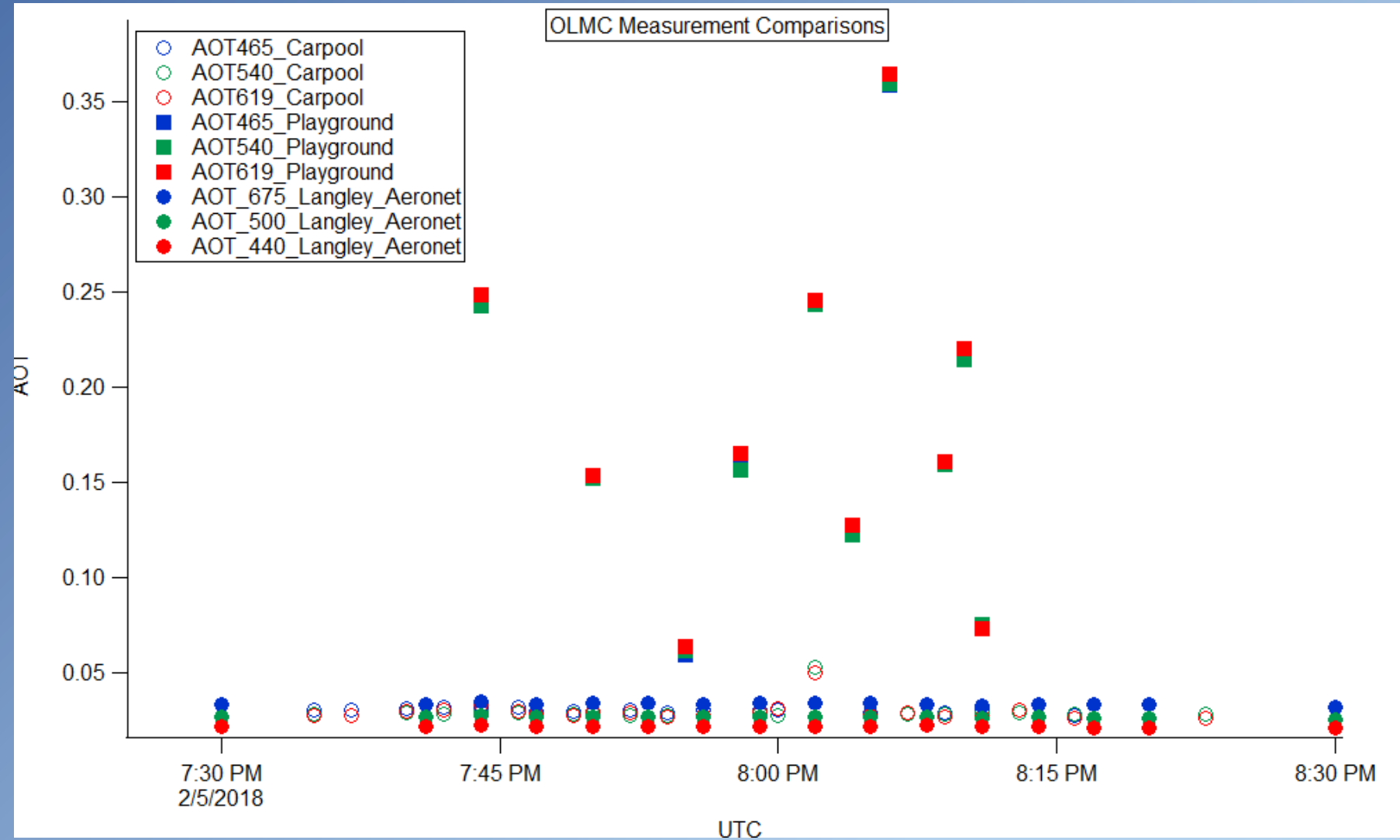
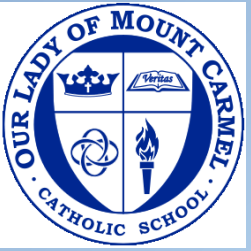
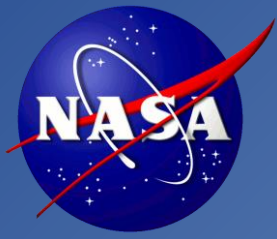
Are they smart enough?

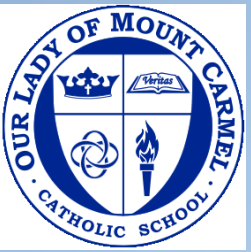




2018 IVSS Projects

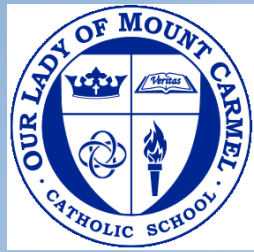
- Began year with aerosol, clouds and atmosphere in Geoscience/Earth Science class
- Brainstormed project ideas
- Trained all students - Measurement leader emerged
- Measurements multiple times per day if possible
- Became an expert (graph of expert vs. another student)



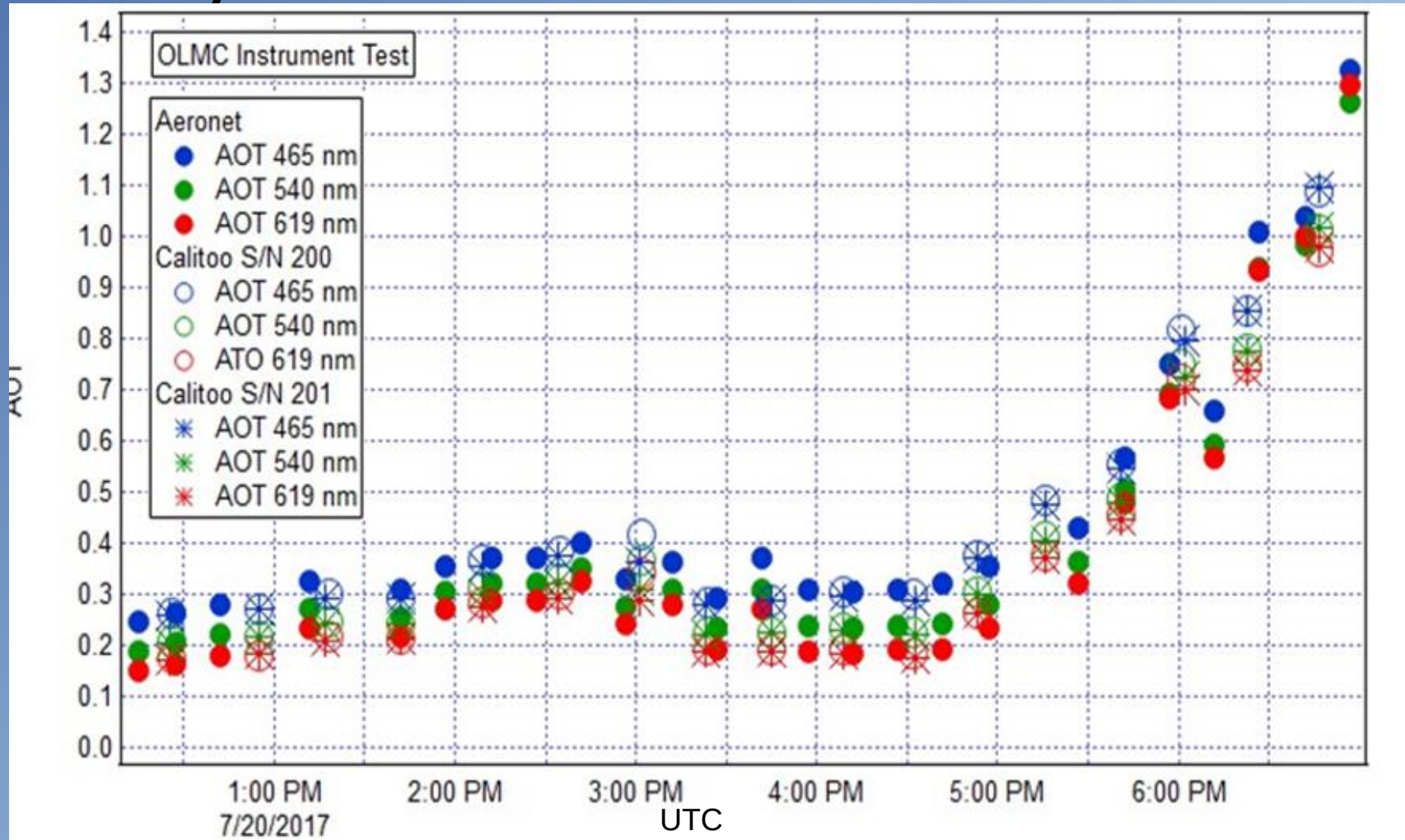


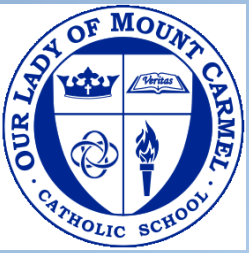
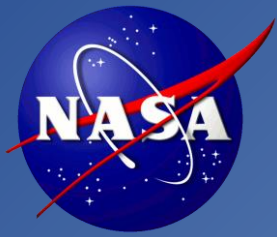
Measurements

- Made Careful Measurements on a Regular Schedule
 - Kept a log of when measurements were made [Days of Measurement-Fall2017 OLMC.xlsx](#)
 - Multiple trials
 - Kept data collection sheets [Calitoo-Data Sheet.pdf](#)
 - Considered precision



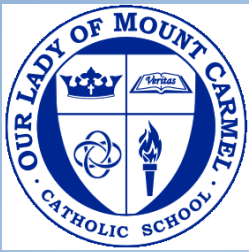
Our Lady of Mount Carmel – AOT and Aeronet





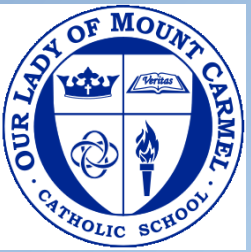
2018 IVSS Projects

- Entered in GLOBE
- Compared with Aeronet
- Validated so we could use Aeronet for other measurements



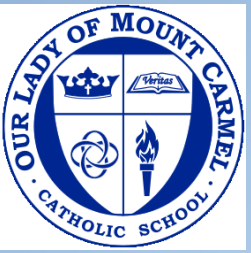
2018 IVSS Projects

- Students were given a day of data from GLOBE and Aeronet to graph in excel
- All students graphed
- Students then examined graphs and developed questions
- Groups were formed based upon interest in questions



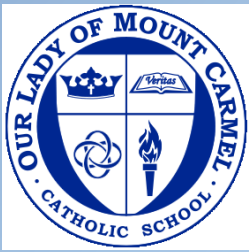
2018 IVSS Project Topics

- Does Carpool Exhaust Affect AOT?
- Compare OLMC AOT to Other Schools
- Does Wind Effect Aerosols?
- How do Aerosols Change Throughout the Day? (2)



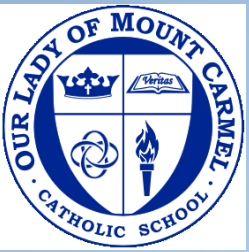
2018 IVSS Projects

- Researched aerosols
- Dr. Pippin and Rosalba Giarratano (intern) visited and advised students on next steps
- Weather Underground and HySplit were used
- Advice on Carpool project



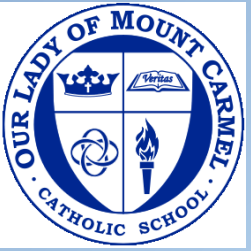
2018 IVSS Projects

- Students continued work
- Dr. Pippin and Mrs. Giarratano visited again for follow up
- Template from IVSS for presentation was used
- Rubrics given to students
- Badges selected (Collaboration and Working with STEM Professional)



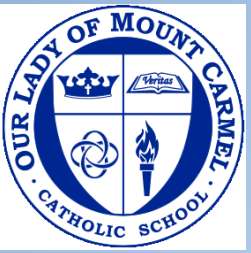
2018 IVSS Projects

- Students collaborated using Google Docs, Slides and Sheets
- Final feedback and changes
- Presentation to NASA professionals
- One month of class time on this Jan 25 – Mar 22
- [Checklist](#) was developed



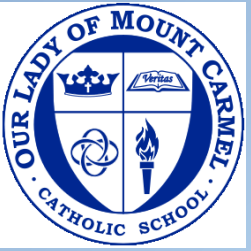
2018 IVSS Projects – Student Achievements

- Analyzed data
- Researched
- Collaborated
- Worked with STEM professional



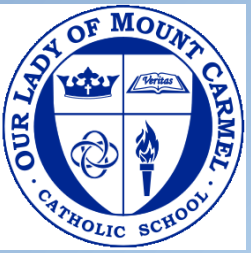
2018 IVSS Projects – Student Achievements

- Math class students got extra time
 - Specialized (Hysplit, Excel, measurements, citations, presentation formatting, background information)
- Communicated with each other
- AUTHENTIC
- Iterative process – very unusual for students



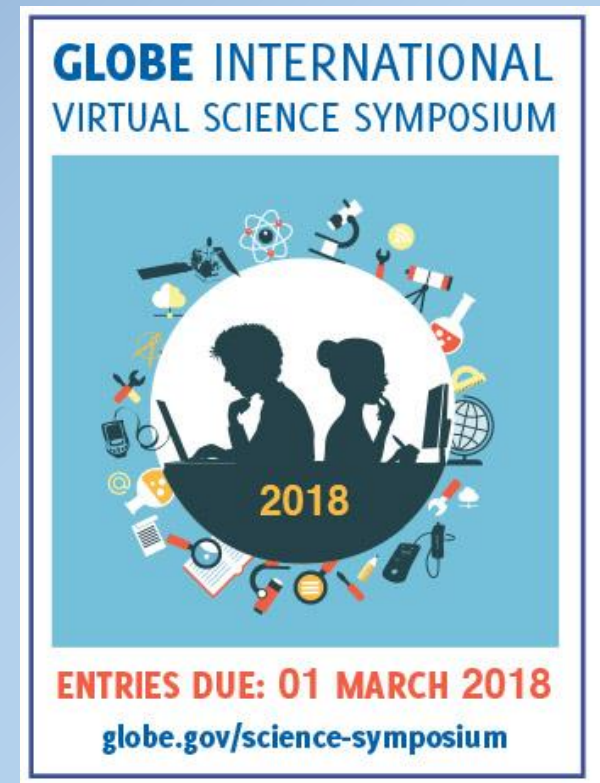
2018 IVSS Projects – Lessons Learned

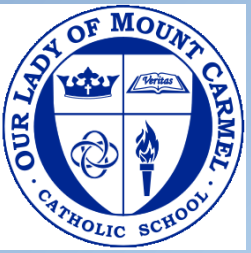
- Takes a lot of time
- Research before questions are developed for better background information
- Changes to traditional science fair to prepare for written portions
- Allow more time for presentation practice
- Developed checklist



IVSS Project Tips

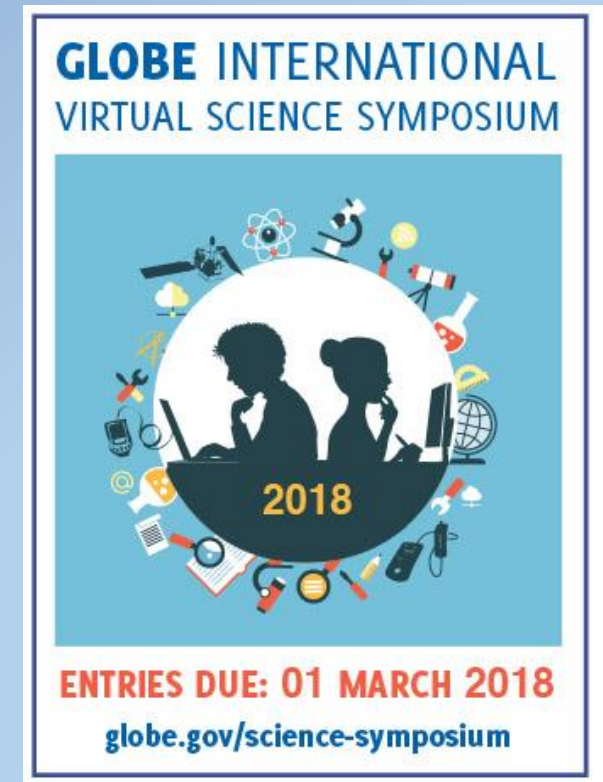
- Consider using historical data for your school or another school
- Have some questions developed but let students generate questions if possible
- Partner with another school or use data retrieval tools to expand options

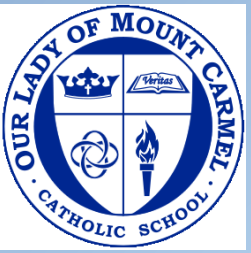
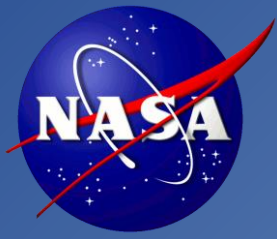




IVSS Project Tips

- Begin early in the year or start in summer if possible
- Provide additional opportunities at lunch or before and after school
- Brainstorm with students following protocol training

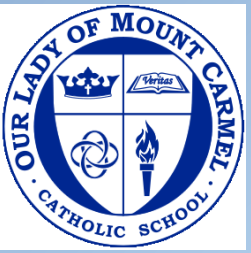
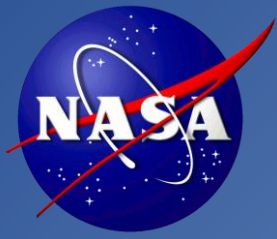




GLOBE General Tips

- Recess bag for measurements
- Start small and grow
- Be persistent – it doesn't happen overnight
- Work with a few students at a time

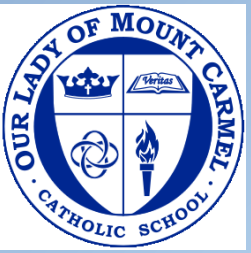
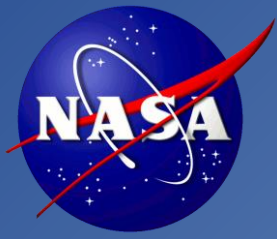




GLOBE General Tips

- Provide a dedicated device for data entry
- Access the database for analysis activities
- Data sheets are vital as the primary source of information

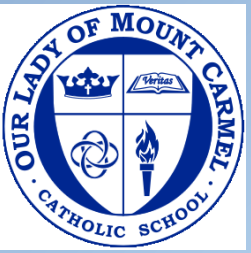




GLOBE General Tips

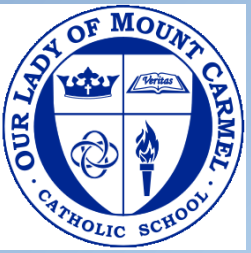
- If you take the entire class outside, have something for everyone to do
- Assign one protocol to a group of students until they are good at it
- Have them train the next group





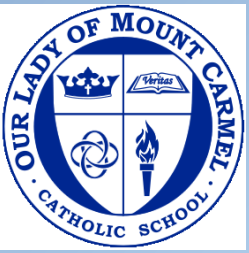
Alternative Implementation

- Make measurements during a weekly genius hour
- Create and maintain a school blog
- Clubs – after school group
- Electives



Parting Thoughts

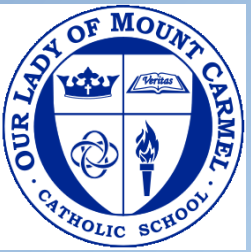
- TAKES TIME
- Implement one protocol at a time
- Let elementary students build on skills in preparation for projects in the middle level
- Participate in field campaigns and collaborate when possible



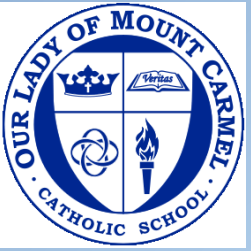
“Thank you so much for you and Dr. Pippin taking the time out of your Friday to show my daughter how NASA research really looks. I cannot tell you how grateful her dad and I are that you have sparked this interest in her this year. She has really blossomed and I am so impressed by how well informed she is about this GLOBE project.”

Parent





I'm SMART enough!



Contact Information

- Angela Rizzi – arizzi@olmc-school.com
- Dr. Margaret Pippin – m.pippin@nasa.gov
- For Elementary GLOBE books contact
 - Jessica Taylor –
jessica.e.taylor@nasa.gov