Canadian Space Agency | Agence spatiale canadienne

SCISAT – Canada's Atmospheric Chemistry Experiment

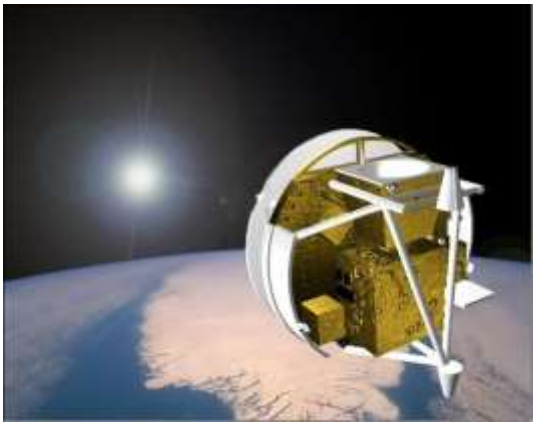

Figure 1: Artist's view of the SciSat spacecraft (image credit: Bristol Aerospace)

THE CHALLENGE:

Explore the concentrations of important atmospheric gases measured by SCISAT to help identify timely events over specific geographical locations.

Access the data subset :
ftp://ftp.asc-csa.gc.ca/users/OpenData_DonneesOuvertes/pub/Space%20Apps%20Challenge%202019/SCISAT/

THE ISSUE

The United Nations has described ozone, ozone depleting substances, and greenhouse gases as priorities through the UN Montreal Protocol and the UN Paris Climate Agreement. Being able to track these gases and interpret their sources and drivers is crucial to understand and adapt to the changes, and ultimately develop mitigation strategies for Canadians across the country.

THE NEED

Comparing across database and identifying atmospheric events

In order to compare the concentrations of atmospheric gases over time, CSA needs to be able to identify atmospheric events such as ozone holes, wildfires in the North, and volcanic eruptions. These deviations should be compared to other periods of the year when gas concentrations are nominal.

The characteristics of these atmospheric events are that they are over a specific geographical region of the Earth or ocean in a similar timeframe year after year. A good comparative tool would make it possible to identify the difference (i.e. increase or decrease) in gas concentrations as a function of time and geographical location.

Potential output

A tool that would show concentrations of ozone and/or a few greenhouse gases (CO_2, CH_4, CFCs) over the same geographical area, and contrast this with concentrations measured at a different time. A database of events that would be identified could be a complementary output.

How to get started

Each gas is in the standard atmospheric Net CDF format, which is also in CSV format on the Government of Canada open database website. One gas would be selected and studied for increases and decreases over the period of time of the SCISAT mission (one season, one year, 5 years, mission lifetime, etc.).

Participants can then try to compare and contrast one gas (ozone, HCl, CH_4, N_2O, CO, etc.) with its concentration at a different time and/or over a different location. Once the numerical algorithm is able to achieve this, participants can do the same thing for another gas of interest to the world's climate research scientists.

You can try and accommodate as many potential gases as you think you can while keeping the user-friendly interface. You don't need to compare all gases, timeframes, or geographical locations. Teams should prioritize quality over quantity. Below you will find links to subsets of data for nearly 30 gases for Spring 2004, and Spring 2010 as an example to compare different periods of time. You can choose other periods if you wish.

BACKGROUND

SCISAT

Launched on August 12, 2003, SCISAT helps a team of Canadian and international scientists improve their understanding of the depletion of the ozone layer, with a special emphasis on the changes occurring over Canada and in the Arctic.

One example of substances that only SCISAT can measure from space is hydrochlorofluorocarbons (HCFCs). HCFCs were introduced as an alternative to chlorofluorocarbons (CFCs), compounds once used as blowing agents for foams and packing materials, and most notably in aerosol sprays and as refrigerants. CFCs were banned through the Montreal Protocol, an international UN agreement between 192 countries, aimed at protecting Earth's ozone layer.

While HCFCs have a radiative forcing effect 10 times weaker than that of CFCs, they are considered harmful to Earth's ozone layer. SCISAT is currently the only space-based instrument with the ability to measure these pollutants and their impact on the environment. That makes SCISAT a critical asset in the global fight against climate change and a strong achievement for Canada.

The above is an exert from: http://www.asc-csa.gc.ca/eng/blog/2018/08/07/scisat-celebrating-15-years-of-success.asp

Montreal Protocol

The Montreal Protocol on Substances that Deplete the Ozone Layer, also known as The Montreal Protocol, was agreed on in 1987 in Montreal, Québec, to preserve the Earth's ozone layer by eliminating the use of many ozone depleting substances. This ozone layer protects us from harmful UV radiation which can cause eye cataracts or skin cancer among other negative health and environmental impacts. The Montreal protocol was the first treaty in United Nations history to achieve universal ratification.

The Paris Agreement

The Paris Agreement is the first-ever universal, legally binding global climate deal. Among its sections, The Climate Agreement includes a heavy focus on mitigation and reducing greenhouse gas emissions. In this regard, the agreement seeks to cap the global average temperature at 2°C by the end of the century. The agreement introduced many directions for achieving these goals, including stock takes, financial flows, capacity building frameworks, emphasizing the world's most vulnerable populations, and prioritizing transparency of all global actions.

C40 Cities

The C40 Cities Climate Leadership Group, or C40 Cities, is a network of 40 cities across the globe committed to tackling climate change by reducing greenhouse gas emissions, improving the physical and economical health and well-being of all citizens, and acting as leaders in the transition towards a healthier and more sustainable future for all. This network thrives through building trusted relationships between cities, sharing ideas and solutions, and even creating friendly competition. As a whole the C40 Network accounts for 25% of the global GDP, 1 in 12 people worldwide, and includes 3 Canadian cities; Vancouver, Toronto, and Montréal.

OTHER RELEVANT INFORMATION

Workshop on SCISAT by CSA experts

Canadian Space Agency SCISAT (ACE)

University of Waterloo ACE