**Methodology**

For our design, we will be using a series of polytetrafluoroethylene (PTFE) filters to capture the sulfate aerosols in the stratosphere and troposphere. The system will be closed for the entire ascent of the rocket since sampling only occurs in the descent. During the descent of the rocket, the system will remain closed until it reaches the stratosphere where the system will be triggered to open at roughly 50km. The system will be activated by a timing system controlled by an Arduino Board that signals a series of solenoid valves to open and close which connect tubing to the PTFE filters.

**Problem Statement**

The primary goal of this project is to determine the concentration of sulfate based aerosols in the troposphere and stratosphere by designing a payload that will intake air through a series of filters and valves. Another goal is to determine the volumetric flow rate and pressure differential between the dynamic and static ports of the rocket by using a mass flow sensor and a pressure transducer.

**Concepts**

<table>
<thead>
<tr>
<th>Greenhouse Gases</th>
<th>Sulfate Aerosols</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absorb infrared solar radiation resulting in a warming effect</td>
<td>Reflect sunlight, reducing the amount of sunlight reaching the Earth's surface resulting in a cooling effect</td>
</tr>
<tr>
<td>Long life span: 10-100 years</td>
<td>Short life span: 3-5 days</td>
</tr>
<tr>
<td>Produced from the burning of fossil fuels, solid waste, trees, etc.</td>
<td>Produced from the burning of coal and oil</td>
</tr>
</tbody>
</table>

**Results**

- System must be able to withstand 25G's and 5.6 Hz of rotation.
- Center of gravity must lie within a 1x1x1 inch in the center.
- No voltage or current on the frame.
- Use of environmental ports is permitted but must have at least 3ft of tubing connecting to the dynamic and static ports of the rocket. Must connect with a male ¼ NPT tube fitting.

**Major Design Components**

In our design, we utilized the components featured in Figure 5, Figure 6, and Figure 7. We separated the components into three subsystems: Filtration System, Tubing/Manifold System, and Electrical System.

**Figure 1: Sulfate vs. CO₂**

Due to the different lifespans and the opposing effects of these particles, it is theorized that this phenomenon serves as an answer to why previous models that have predicted the effects of greenhouse gases are at the lower end of their predictions. Figure 1 depicts the difference in lifespans of sulfate and carbon dioxide. Since the lifespan of CO₂ is significantly larger than that of sulfate, after the 3 – 5 days when sulfate begins to level off and decrease, CO₂ continues to increase.

**Figure 2: Flight Trajectory**

Due to the different lifespans and the opposing effects of these particles, it is theorized that this phenomenon serves as an answer to why previous models that have predicted the effects of greenhouse gases are at the lower end of their predictions.