

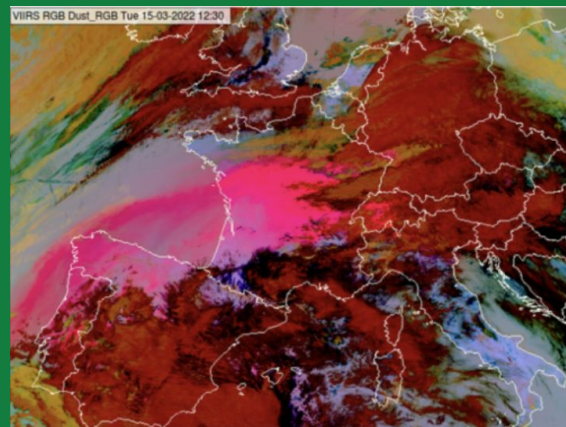
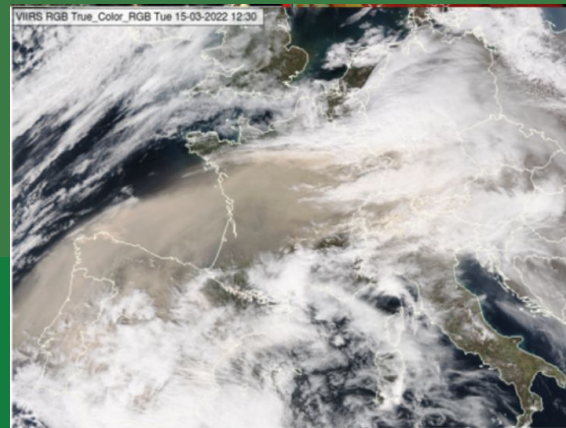


Satellite Dust Image Interpreter

Tara Chugh

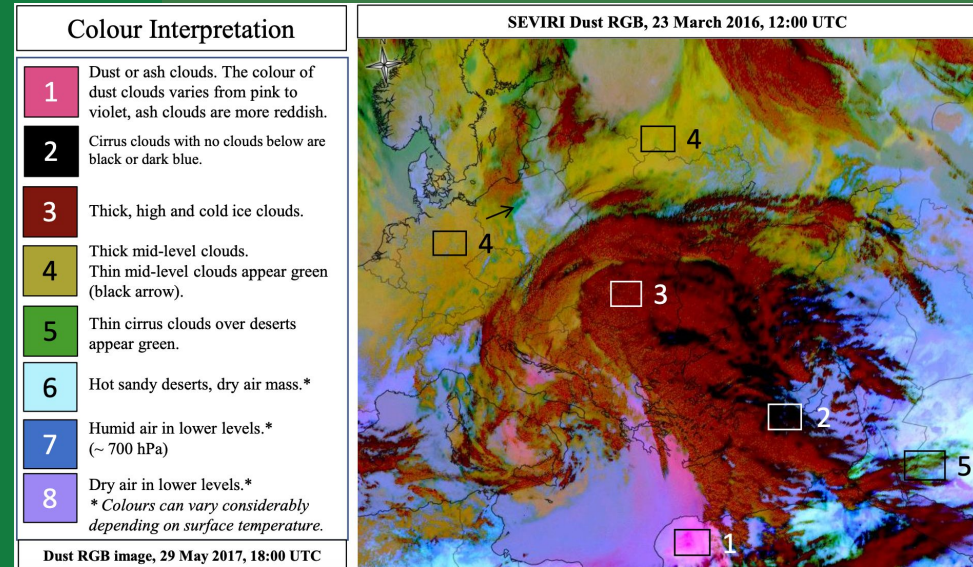
Introduction

- Dust is the largest component of aerosols in Earth's atmosphere and has climate impacts ranging from ocean temperatures to hurricanes
- In satellite images, it's difficult to distinguish between dust, fog, and clouds because they appear similar colors
 - False color images called Dust RGB images can help distinguish between dust, fog, and clouds
- This project automates Dust RGB interpretation with an interactive tool



Background

- Satellites capture images at multiple wavelengths of light
- Dust RGB images merge visible and infrared images to show dust and clouds more clearly
- Meteorologists must be specially trained to manually interpret these images using color references



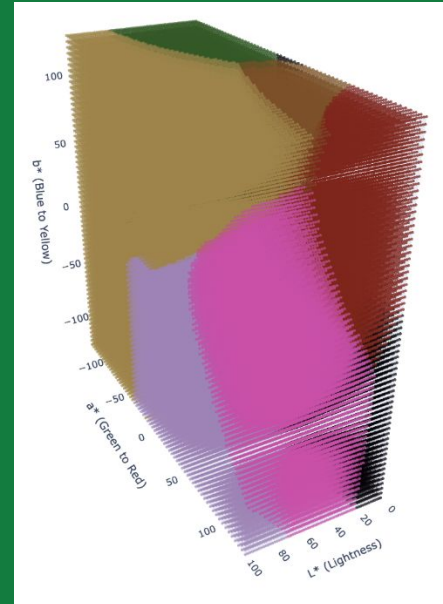
Source: SEVIRI Dust RGB Quick Guide

Methodology/Approach

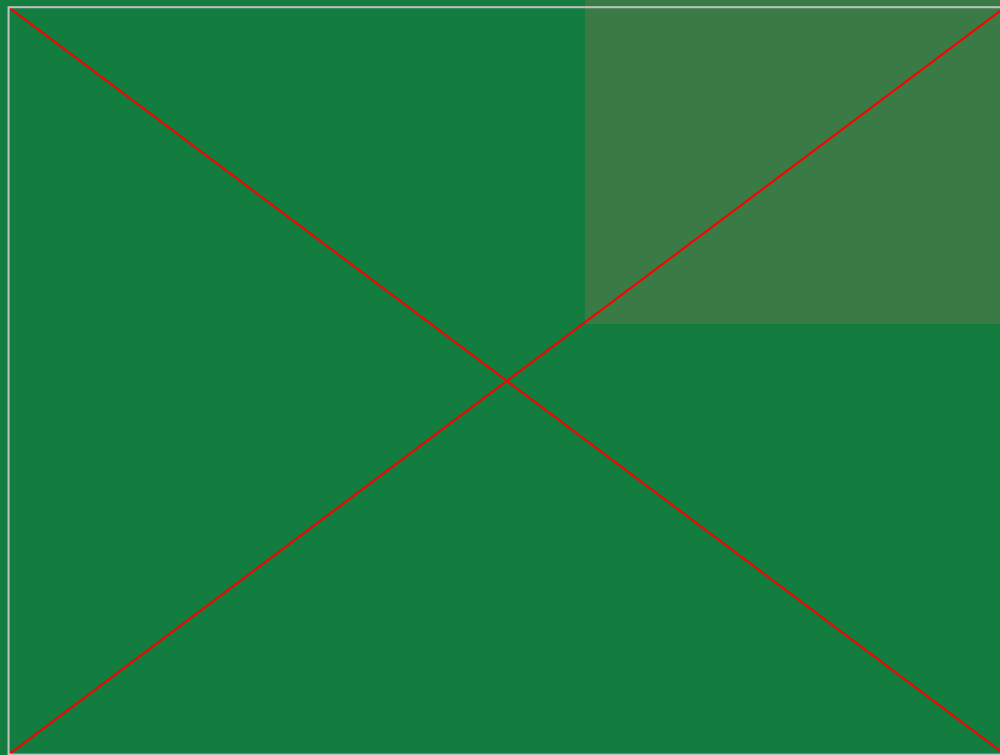
- Identified 7 representative colors for dust/fog/cloud conditions
- Used the $L^*a^*b^*$ color space, where the distance between colors matches humans' perceived difference
 - I mapped every possible value in the $L^*a^*b^*$ space to one of these 7 colors
 - These mappings match how a human would categorize each color
- Built a PyQt5 application to analyze Dust RGB images in real time

Feature	Red Pixel Value	Green Pixel Value	Blue Pixel Value
Dust aloft	235	50	175
High, thick cloud	150	5	5
High, thin cloud	5	1	5
Mid, thick cloud	140	75	15
Mid, thin cloud	15	90	20
Low, thick cloud (warm climate)	170	130	190
Low, thick cloud (cold climate)	170	130	50

Source: Journal of Operational Meteorology



Results



- The tool automates the interpretation of colors in a Dust RGB image
- There's no readily available composite dataset of fog, dust, and cloud conditions to validate my categorizations against

Discussion

- This application makes Dust RGB interpretation accessible to non-meteorologists
- It provides a less subjective interpretation of Dust RGB images that meteorologists could use
- With more time, I would incorporate climate data from ground stations for the application to use in identifying dust/cloud/fog conditions in specific areas