

Atmospheric aerosols can come in all sizes and types. The origin of these aerosols is also very complicated. Over the years scientists have been able to measure the percentages of the various types from different parts of the world.

The table below shows the results in percent compiled by NOAA's Earth Systems Research Laboratory.

Atmospheric Aerosols						
Location	Sea Salt	Dust	Water Droplets	Sulfate (SO <sub>4</sub> )	Organic Particulates (PAH, etc)	Other
Marine	40%		30%	15%		15%
Europe	3%		23%	46%	10%	18%
Africa	5%	3%	13%	40%	20%	19%
India		4%	28%	44%	5%	19%
Asia	1%	22%	20%	27%	20%	10%
USA		1%	20%	19%	50%	10%

**Problem 1** – In which direction (rows or columns) do you expect the percentages to add up to 100% and why?

**Problem 2** – Draw a pie graph showing the percentages of the various aerosol contributions over the United States. What type of aerosol is the most abundant?

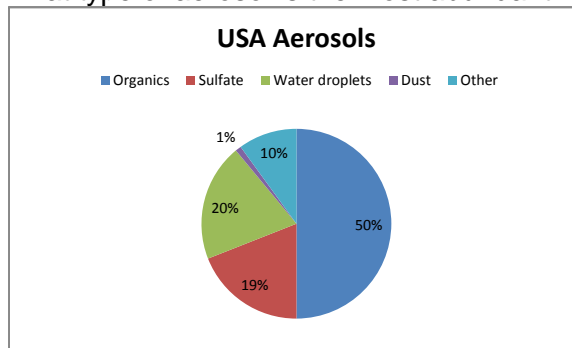
**Problem 3** – Create a pie graph that shows the percentage abundance of sulfate aerosols over the 6 different regions. Which region has the highest abundance?

**Problem 4** – Sulfate aerosols and organic particulates are typically man-made from industrial processes and the burning of fossil fuels. Which region has the highest concentration of industrial sources of aerosols, and why do you think this trend occurs?

NOAA aerosol data from Earth System Research Laboratory:  
<http://www.esrl.noaa.gov/research/themes/aerosols/#fig1>

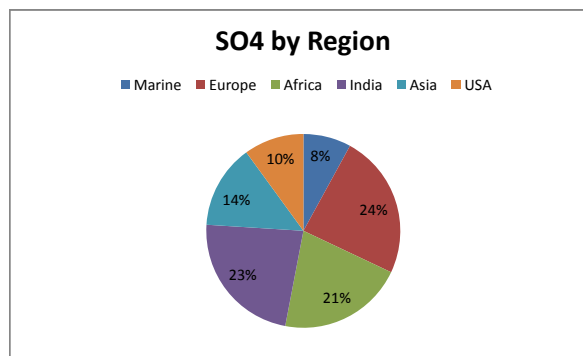
**Problem 1** – In which direction (rows or columns) do you expect the percentages to add up to 100% and why? Answer: **The total percentage of aerosols has to add up to 100% because this table is indicating the types of aerosols found in the study. The only direction in which this happens in the table is along the rows, so each row adds up to 100% for the indicated location.**

**Problem 2** – Draw a pie graph showing the percentages of the various aerosol contributions over the United States. What type of aerosol is the most abundant? Answer: See below.



**Problem 3** – Create a pie graph that shows the percentage abundance of sulfate aerosols over the 6 different regions. Which region has the highest abundance?

Answer: First you have to add up the percentages for each region:  $15\% + 46\% + 40\% + 44\% + 27\% + 19\% = 191\%$ . Then divide each percentage by 191% to get the percentage for each region. Marine =  $100\% \times (15/191) = 8\%$ ; Europe = 24%; Africa = 21%; India = 23%; Asia = 14% and USA = 10%. Now create the pie graph. Europe has the highest concentration (24%).



**Problem 4** – Sulfate aerosols and organic particulates are typically man-made from industrial processes and the burning of fossil fuels. Which region has the highest concentration of industrial sources of aerosols and why do you think this trend occurs?

Answer: From the table, if we combine the columns for Sulfate and Organic Particulates we see that the **USA with 69% is the largest**. This is probably because the USA is more 'industrialized' than other countries, especially along its East Coast.