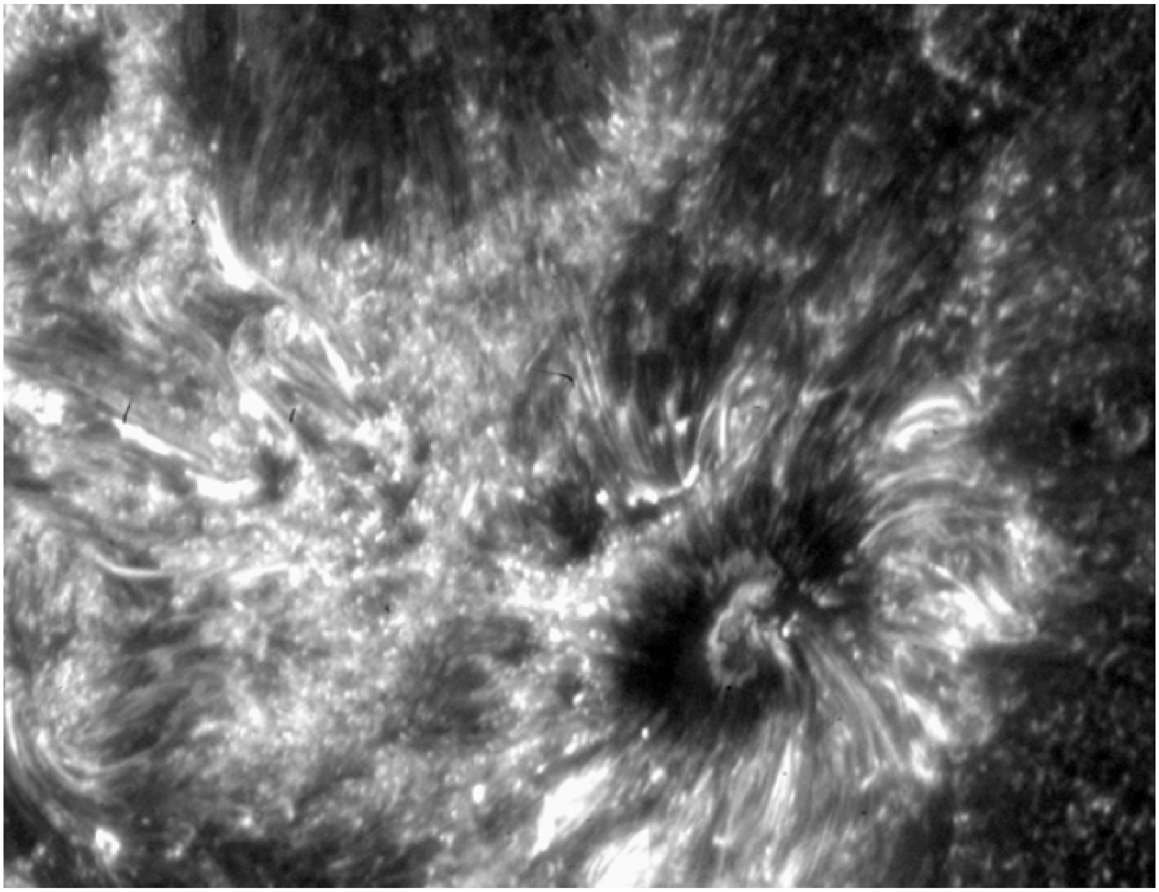

This spectacular image of the solar atmosphere was obtained by NASA's IRIS satellite. The smallest details are 240 km (150 miles) across, and the image shows many small bright 'dots' where energy is being released and transported into the solar corona. The bright spots come and go in less than an hour, and the solar surface is peppered with millions of these regions. This image is 72,000 km across.

Problem 1 – The radius of the sun is 690,000 km. What is the surface area of the spherical sun in km^2?

Problem 2 – What percentage of the sun's surface area does the square IRIS image above represent?

Problem 3 – Suppose that each bright point is a cylinder 10,000 km tall with a diameter of 200 km in diameter. What is the volume of the cylinder in kilometers?

Problem 4 – The magnetic energy stored in this volume is 4.0×10^{10} Joules/km^3. If a single 10 megaton hydrogen bomb produces 4×10^{15} Joules, how many megatons of energy is produced by this region?

Problem 1 – The radius of the sun is 690,000 km. What is the surface area of the spherical sun in km^2?

Answer: $A = 4 \pi R^2$, so
$A = 4 \times 3.141 \times (690,000)^2$
$= \mathbf{5.6x10^{12}\ km^2}$

Problem 2 – What percentage of the sun's surface area does the square IRIS image above represent?

Answer: Image area = $(72,000)^2 = 5.2x10^9\ km^2$.
So $P = 100\% \times 5.2x10^9/5.6x10^{12}$ = **0.09%**

Problem 3 – Suppose that each bright point is a cylinder 10,000 km tall with a diameter of 200 km in diameter. What is the volume of the cylinder in cubic meters?

Answer: $V = \pi R^2 h$. $V = 3.141 \times (100\ km)^2 \times 10,000\ km$ = $\mathbf{3.1x10^8\ km^3}$.

Problem 4 – The magnetic energy stored in this volume is $4.0x10^{10}$ Joules/km^3. If a single 10 megaton hydrogen bomb produces 4×10^{15} Joules, how many megatons of energy is produced by this region?

Answer: $E = 4.0x10^{10}\ J/km^3 \times 3.1x10^8\ km^3 = 1.2x10^{19}$ Joules.

$M = 1.2x10^{19}$ Joules/$4.0x10^{15}$ = **3000 megatons**.

This equals 300, 10 megaton hydrogen bombs!