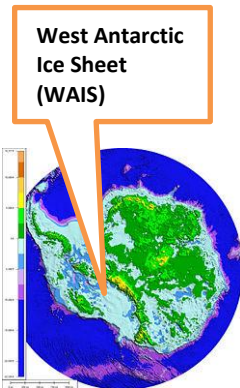


# FLUIDS

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## Scientists Report **(((Faster Warming in Antarctica)))**



Researchers in Antarctica have been keeping track of temperature and other weather variables there since the late 1950s.

**INTRODUCTION:** The west Antarctica ice sheet (WAIS) (from Wikipedia) is about 10% of all the ice in Antarctica ( $25.4 \times 10^6 \text{ km}^3$ ) or about  $2.2 \times 10^6 \text{ km}^3$ . The earth has a radius of 6378 km. Area of a sphere =  $4\pi r^2$ , Earth's oceans cover 71% of earth's surface, Density = mass/volume or  $D = m/V$ , where  $V = Ah$  ( $A$  = area,  $h$  = height), thus  $D = m/Ah$  or  $DAh = m$  (eq. 1),  $D_{\text{ice}} = 0.92 \times 10^{12} \text{ kg/km}^3$ ,  $3.28 \text{ ft} = 1 \text{ meter}$

**QUESTIONS:** (a) Find surface area of earth in  $\text{km}^2$ ? (b) Find surface area of oceans in  $\text{km}^2$ ? (c) With the above data find mass of WAIS in kg.? (d) Using eq.1 find how much earth's oceans would rise ( $h$  in meters and ft.) "if" WAIS melted?

**ANSWERS:** (a)  $5.1118 \times 10^8 \text{ km}^2$  (b)  $3.6294 \times 10^8 \text{ km}^2$   
(c)  $2.024 \times 10^{18} \text{ kg}$ . (d) 5.56 m or 18.29 ft

**Comment:** on answer (d)... This >18 ft (~5.56 m) rise in all oceans is due to "just" 10% of Antarctica melting. 10% is mass of WAIS. In January 2006, in a UK (United Kingdom) government commissioned a report and head of British Antarctic Survey, Dr. Chris Rapley, said **".. if WAIS were to melt the oceans would rise 4.8 m."** Look how close your calculated prediction ( $h = \sim 5.56 \text{ m}$ ) came to British Antarctic Survey estimate of 4.8 m (~15.74 ft.). Also, note how we confirmed what the author (NYTimes) said below, "Global sea levels could rise 10 or more feet" Three glaciers in WAIS: Pine Island, Thwaites, and Smith cause oceans rise 0.24 mm/yr.

**West Antarctica has warmed much more than scientists had thought over the last half century, new research suggests, an ominous finding given **(((that the huge ice sheet there may be vulnerable to long-term collapse, with potentially drastic effects on sea levels.)))**** A paper released Sunday by the journal Nature Geoscience reports that **the temperature at a research station in the middle of **(((West Antarctica has warmed by 4.4 degrees Fahrenheit since 1958)))****. That is roughly twice as much as scientists previously thought and three times the overall rate of **global warming**, making central West Antarctica one of the fastest-warming regions on earth. "The surprises keep coming," said Andrew J. Monaghan, a scientist at the **National Center for Atmospheric Research** in Boulder, Colo., who took part in the study. **"When you see this type of warming, I think it's alarming."** A potential collapse of the West Antarctic ice sheet is one of the long-term hazards that have led experts to worry about global warming. The base of the ice sheet sits below sea level, in a configuration that makes it **especially vulnerable**. **Scientists say a breakup of the ice sheet, over a period that would presumably last at least several hundred years, could **(((raise global sea levels by 10 feet, possibly more)))****. At a lonely outpost called **Byrd Station**, in central West Antarctica, people and automated equipment have been keeping track of temperature and other weather variables since the late 1950s.