

LAB II: COLLECTING MEASUREMENTS & COMPARING TO P.I.G.**P.I.G.****GLACIER GOO**

How does your glacier match up to P.I.G.? You will collect measurements on the **elevation** and **velocity** of your glacier, and see how your glacier compares to P.I.G.!

Elevation Change:

- Let's collect some measurements to see how your glacier elevation matches up to the P.I.G. glacier. You will use your stopwatch to measure how long it takes the glacier to lose 1 cm of elevation. Return to baseline, and mark a line on the outside of the container both at surface level and 1 cm below the surface (*Images 12 and 13*). Release the goo and start your stopwatch! Stop the watch when the glacier has dropped to the 1 cm line marked on the container. (Report in seconds)

(Note – glacier goo can stick to the container wall if it spreads to the edge – use your knife to carefully clear this so you get an accurate time for your 1 cm elevation change. Be careful not to push down on the surface and change the elevation!)



Image 12) Mark up surface and 1 cm drop **Image 13) Time goo as it drops 1 cm**
Repeat 2 other times, or pool class results for an average.

Time 1

Time 2

Time 3

Average

The average elevation change you calculated is:
1 cm/ _____ secs

Round this to the nearest minute before comparing to P.I.G.
1 cm/ _____ mins.

Place your answer in the Glacier Goo results box below.

Name _____

Date _____

2. **Compare your glacier elevation changes to P.I.G.** How long did it take P.I.G. to lose 1 cm in elevation? Use the timeframe of 2003-2007 rounding to 4 years. Use two 'DELTA (Δ)' columns on the chart on **page 7** for elevation change. Find the row that shows the largest drop in meters and write it in the blank below (you don't need the negative sign).

P.I.G. dropped _____ meters/ 4 years

Divide for _____ meters/1 year

To better compare the two sets of measures convert the meters to cm

_____ meters X 100 cm = _____ cm/ 1 year

365 days in a year = _____ cm/ 365 days

To determine how long it takes P.I.G. to drop 1 cm divide 365 days by the number of cms. Place you answer in the results box.

RESULTS

P.I.G. 1 cms/ _____ days	Glacier Goo 1cm/ _____ mins.
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Think Scale - P.I.G. is dropping by cms/day while your glacier is dropping by cms/mins.

How does your changing elevation compare to that of P.I.G.? _____
_____?

What if P.I.G. was made out of glacier goo, how would that affect its elevation loss? _____

3. **Velocity:**

Now examine the velocity (rate of flow). Using a stopwatch you are going to measure the velocity of your glacier & then compare it to the velocity of P.I.G.

In its fastest flowing sections P.I.G. has been measured at **~3.5 km/yr or 9.6 m/day** (this is ~31ft/day!) Let's see what your glacier goo can do!

What is your Velocity? **Velocity = Distance/Time**

Your graph paper is marked to show 10 cms of distance. This will be your distance (D). Return to baseline. Use your stopwatch to time the glacier flow on the 10 cm section on your grid. Start the stopwatch as soon as the toe of the glacier touches the top of the marked square and stop timing as soon as it touches the bottom of the marked square. Record the time below. Repeat twice more, or pool class results to get an average (**round to the nearest minute**).

_____	_____	_____	_____
Time #1	Time #2	Time #3	Average Time

Velocity (V = D/T) V = 10cm/ _____ min

Name _____

Date _____

4. **How does that compare to P.I.G.'s velocity?** We know how many meters P.I.G. can travel in a day so convert your glacier velocity into meters. This is easy to do since you measured 10cms so multiplying both sides of your equation by 10.

$V = 1\text{meter}/(\# \text{ mins.} \times 10)$ OR minutes^* (* insert this number wherever you see this symbol below)

Your glacier needs * _____ minutes to travel 1m

So how far will it go in a day? There are 1440 minutes in a **day**. Divide by your minutes
 $1440\text{mins}/\text{_____}$ (your minutes starred above) to get _____ m/day

RESULTS

Glacier Goo $V =$ _____ m/days	P.I.G. $V =$ <u>9.6</u> m/day
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How does the velocity of your glacier goo compare to P.I.G.? _____

5. Glacier goo is not the same as a real glacier but it can help us learn about real glaciers. What are three things you have learned about P.I.G. working with your own glacier model, be sure at least one mentions a connection to climate.

10 cms start here

10 cms stop here

POLAR I.C.E. (Interactive Climate Education)

GLACIER GOO

For Use in Modeling Glaciers

Mix#1:

One 20 oz cup
1 stirring stick
3/4 cup warm water
1 cup Elmers white glue

Mix#2:

one 8 oz cup
1/2 cup warm water
one stirring stick (for the 8 oz cup)
2 tsp. Borax powder
1 qt plastic zip lock bag

Mix # 1:

In the large cup, add 3/4 cup warm water and 1 cup glue. Stir until well mixed.

Mix # 2:

In the smaller cup, measure 1/2 cup warm water. Add 2 tsp. of Borax powder.

Stir

until the powder is dissolved.

Pour Mix 2 (the powder mix) into the glue mix. Stir until a glob forms and most of the water is mixed in. This happens quickly! Knead and work the mix for 2 – 3 minutes. Most, if not all, of the water will be incorporated into the mixture.

Place the glacier goo in the zip lock bag.

The mixture will store for a few months.

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More Activities: <http://www.ldeo.columbia.edu/polareducation>