Shelf Sediment Accumulation

These activities utilize bathymetric data to document spatial sedimentation accumulation for each system. You will use bathymetric grid data within GeoMap App to create down-channel and cross-channel profiles at different levels within each river system. Students will be able to document areas of deep incision or broad floodplains, as well as shelf and slope morphology at the continental margins. Students will utilize shelf width, sediment accumulation, and seismic data within GeoMapApp to examine questions related to spatial sedimentation patterns in specific river-shelf systems. Students will synthesize data to predict future sedimentation patterns given changes in one or more variables that control current shelf sedimentation development. S2S concepts will be tied together and you will examine how changes in subsidence, sea level, and sediment supply will influence accommodation and in the long-term the stratigraphy of the system.

**Part I. Introductory Concept Map**

Working individually create a concept map for influences on sediment accumulation in continental shelf margins. You will share your maps with other students and the class.

**Part II. PowerPoint**

**Part III Activities –Accumulation Relationship and GeoMappApp**

1. Accumulation Space Graph.
2. Working in pairs hypothesis about what kind of relationship might exist between shelf accommodation space (shelf width – distance from river mouth to the 200 m isobath) and the amount of sediment that can be stored on the shelf. Come up with a single statement regarding the relationship between accommodation space and sediment storage.
3. Working in pairs exploring the relationship between amount of room for the sediment and where the sediment ends up in these hypothetical systems by plotting the % off-shelf accumulation versus shelf width. Then determine which type of regression type best describes this relationship (linear, logarithmic, exponential, polynomial, or other). Find the equation of the line and the R2 value.

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| --- | --- | --- | --- | --- | --- |
|  | Site A | Site B | Site C | Site D | Site E |
| Shelf Width (km) | 325 | 120 | 50 | 22 | 1 |
| % Off-shelf Accumulation | 1 | 5 | 32 | 75 | 90 |

Questions

1. How did your hypothesis regarding storage space and amount of sediment accumulation compare to the relationship noted from the data?
2. Note that as your R2 value was not equal to 1.0 the % off-shelf accumulation must also be influenced by other variables. What other factors, aside from shelf width will play a role in the relative amount of sediment stored off versus on shelf?
3. Collision margins receive greater than 50% of their sediment supply from rivers; will most of these sediments accumulate on or off shelf?
4. Do a literature search to find the shelf width at the mouth of three rivers. Using the equation of the line you determined, calculate the percent of sediment that will accumulate on the shelf for those three systems.
5. Use GeoMapApp to create profiles for the Fly and Waipaoa systems.

If you’re unfamiliar with GeoMappApp have the students view this tutorial (<http://www.geomapapp.org/tutorials/profile_tool/profile_tool_20080812/profile_tool_20080812.html>) and/or utilize this activity first (http://serc.carleton.edu/margins/minilessons/32959.html).

Using GeoMappApp explore the down-channel and across-channel profiles for similarities and differences between the Fly and Waipaoa systems to determine the down-channel and across-channel similarities and differences between the Fly and Waiapoa systems?

Answer the Following

1. What similarities and differences exist between the profiles for the Fly and Waipoa systems?

2. In which system would you predict the shelf would fill with sediment first?

3. Where would sediment go after the shelf accommodation space is maxed out?

4. Predict what would happen for each system in terms of sediment dispersal if a) sea level were to falls, b) sea level were to rise, c) land use patterns in the watershed changed from forest to agriculture, or d) best management practices decreased sediment supply to the system?