

Google Earth and meandering rivers

Today we are going to look at meandering rivers in Google Earth. We'll explore rivers in China, Ohio, Taiwan, and Washington to see how meanders move over time and also how meanders form in bedrock rivers.

1. Now fly to Yakeshi, China (Question 1 on the KMZ file). Just north of the city is a beautiful series of scroll bars (former point bars that have been abandoned) formed by the meandering river moving across the landscape. Describe what you are seeing here. How are the meanders moving over time? Is the river becoming straighter or more curved? How long is the river through a particular reach compared to the birds-flight distance? (For this you'll want to measure along the river and then measure a straight line between those two end points.) This ratio (river length divided by straight line length) is called the sinuosity of the river.

2. Other important measurements for meandering rivers include the radius of curvature, amplitude, and wavelength.

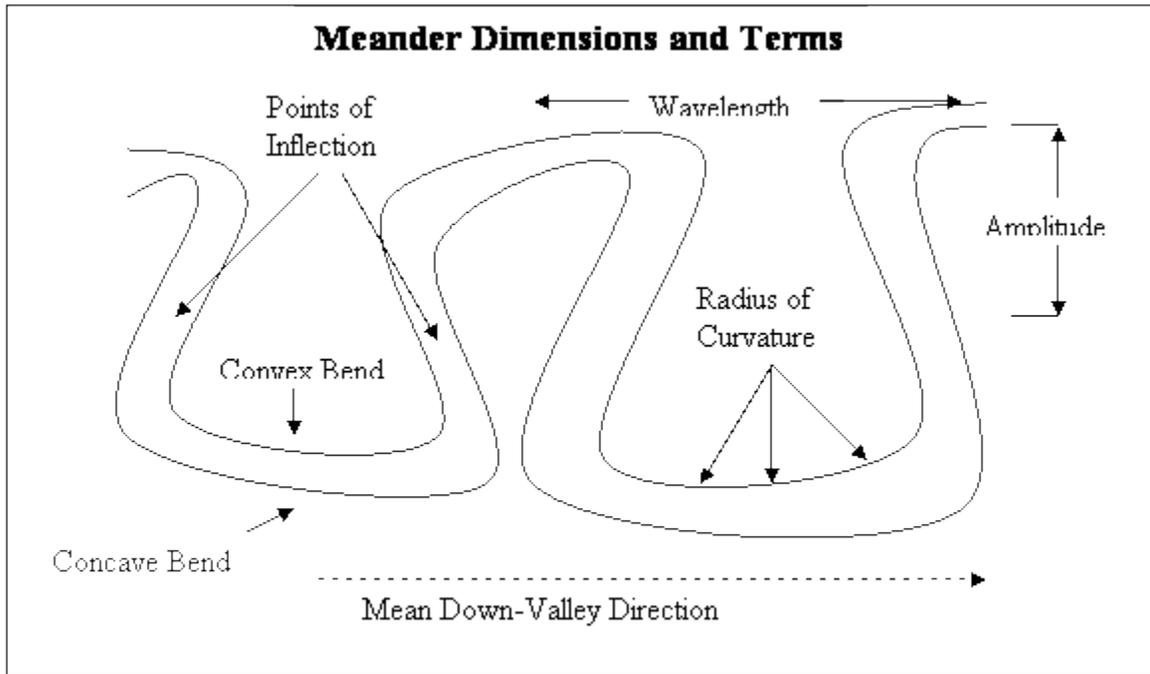


Figure 1: Meandering river terms. Image from: http://www.sierrapotomac.org/W_Needham/MeanderingRivers.htm

Using the information from the image above, describe in words what the wavelength, radius of curvature, and amplitude are.

Calculate these values for the river outside Yakeshi.

3. Fly to the Green River in Washington state. (Question 3 on KMZ file) There should be a little button labeled 1990 in the lower left of the screen. Click on that. You'll notice that the image changes back to 1990 and a tool bar with dates shows up in the upper left of your screen. You can use the arrows on this toolbar to scroll through images taken at different time. There are 14 images at this site over a period of 25 years. For one image for each year of photos (so only one of the two 2002 images, for example), use the line drawing tool to trace the main channel of the Green River across your screen in the area contained within the white box. Describe how the river has moved over time. Measure how far it has moved between 1990 and 2010. What are the sinuosity, amplitude, radius of curvature, and wavelength here for each of the images you looked at? Did those values change over time?

4. Fly to Harbin, China (Question 4 on KMZ file). This isn't too far away from Yakeshi and also has scroll bars. What is sinuosity, amplitude, wavelength, and radius of curvature here? How is this, much larger, river changing over time (based on what you can tell from the scroll bars as there are no historic images for China)?

5. Now we're going to look at meandering rivers in bedrock (seriously – they are really cool). Fly to Wutai, Taiwan (Question 5 on KMZ file). You should be looking down at a mountainous landscape with some seriously meandering rivers. Fly around the landscape. How do the sinuosity, amplitude, wavelength, and radius of curvature here differ from the flatter rivers in Yakeshi and Harbin? What process is forming the meanders here? In other words, how on earth do you get a river to meander in bedrock? Note that the rivers are not running on the top of the mountains – this is an optical illusion that has to do with where the sun is when the image was taken and where you expect it to be.

6. Now we're going to be a little closer to home. Fly to Carlisle Reservation, Ohio (Question 6 on KMZ). We'll have some images from the 1950s through today in the field with us. What do you expect to see? Do you see any evidence of the meander bends moving? What are the sinuosity, wavelength, amplitude, and radius of curvature here?

7. Now that you've looked at so many rivers, please compare and contrast the processes going on in Yakeshi, the Green River, Harbin, Taiwan, and Carlisle Reservation. Take into account the geology, climate, and anthropogenic setting of the sites. For example, be sure to look for dams upstream of locations. You may want to ask the internet for help with the geologic/climatic setting of each site.