MAR 110 LECTURE #22b
APPENDIX: Real Tides

OBSERVED Tides
Sea Level Records

Figure 22b.2 Real Ocean Tides
Sea level records from different locations reveal tides that are dominated by the twice-a-day or semidiurnal tide (top) or the once-a-day or diurnal tide (bottom). A mixture of the two period tides is more common. (LEiO)

(b) IDEALIZED WAVE SPECTRUM
Figure 22b.1 Tides
Tidal wave energy is concentrated at periods of approximately 12 and 24 hours. (ItO)
Figure 22b.4 Realistic Ocean Tides
On the real Earth oceans are contained in basins bounded by the continents; not covered by the ocean. Thus the astronomical tidal forcing creates a standing tidal wave in our idealized ocean basin that is meant to model the Atlantic Ocean. (ItO)

Figure 22b.3 Bay of Fundy and Tidal Bores
In regions with significant tides such as the Bay of Fundy it is not unusual for a tidal bore to form which is a wave or wall of water at the leading edge of the tide wave (right), particularly in rivers or narrow bays and passages. The tidal bore will continue upstream into the bay or river sometimes for a hundred miles or more (ex: the Yellow River in China). Since this wave or wall of water has the mass of the tide behind it, people can use it to push surfers or even boats upstream for long distances. (??, ItO, LeIO)
The tidal waves in our idealized enclosed ocean basins are the rotary standing waves as illustrated above because of the effects of Earth rotation. Note how the sea level highs (and lows) rotate around a node in the center of the idealized basin – a point of no tide or amphidromic point in what is called an amphidromic system. (ItO)
North Atlantic Tides - similar patterns

Figure 22b.7 The Atlantic Ocean Amphidromic System
The North Atlantic tidal system closely resembles an ideal amphidromic system with some deviation due to bathymetry. (ItO)

Figure 22b.6 Cotidal Chart of an Amphidromic System
The tidal action in an amphidromic system can be neatly summarized in a cotidal chart, which looks like a wagon-wheel. Cotidal lines (the spokes) mark the location of high tide at each lunar hour during the tidal cycle. The orange lines (the circular wheel rim) mark the locations with the same tidal ranges. (ItO)
Bay of Fundy Tides

Figure 22b.9 Bay of Fundy and Tidal Bores
In regions with significant tides such as the Bay of Fundy it is not unusual for a tidal bore to form which is a wave or wall of water at the leading edge of the tide wave (right), particularly in rivers or narrow bays and passages. The tidal bore will continue upstream into the bay or river sometimes for a hundred miles or more (ex: the Yellow River in China). Since this wave or wall of water has the mass of the tide behind it, people can use it to push surfers or even boats upstream for long distances. (??, ItO, LEIO)