

# Time Zones

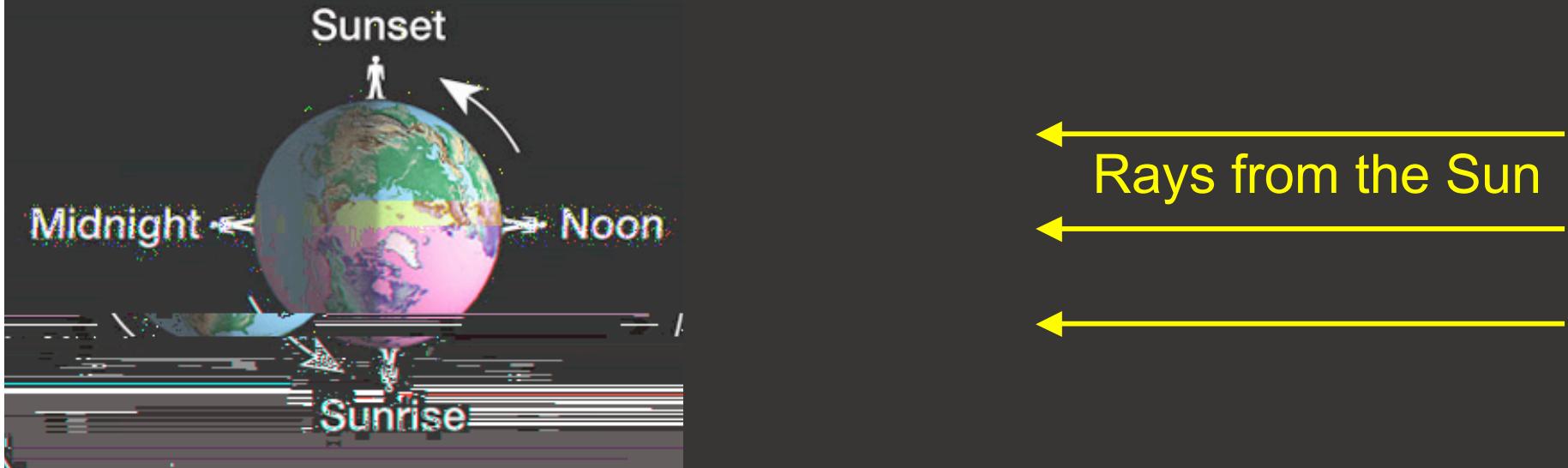
Doug Fischer  
Geog 106 LRS

# Learning goals

- Students should be able to
- Explain time zones as a function of longitude
- Calculate time differences between different locations
- Demonstrate corrections for daylight savings time

# Why we have time zones

- At the same instant that it's noon for us it's midnight for others



*(Looking “down” at the North Pole)*

# Time zones

- Are based on solar noon - when the subsolar point crosses your meridian
- Local solar time worked until railroads
  - Each town set its own time based on solar noon
- Consistent time zones are required for trains, phones, etc.
- We all set clocks to solar time of a “central meridian”
  - All towns set their clocks to solar noon of nearest central meridian

# Time zones

- We generally use 24 time zones, all using the same “minute hand” on the clock and just varying the “hour hand”
- This means there are 24 central meridians around the globe
- Width of a time zone?
  - (360 degrees of longitude around the Earth divided by 24 time zones
  - = 15 degrees of longitude per time zone)

# Locations of Time Zones

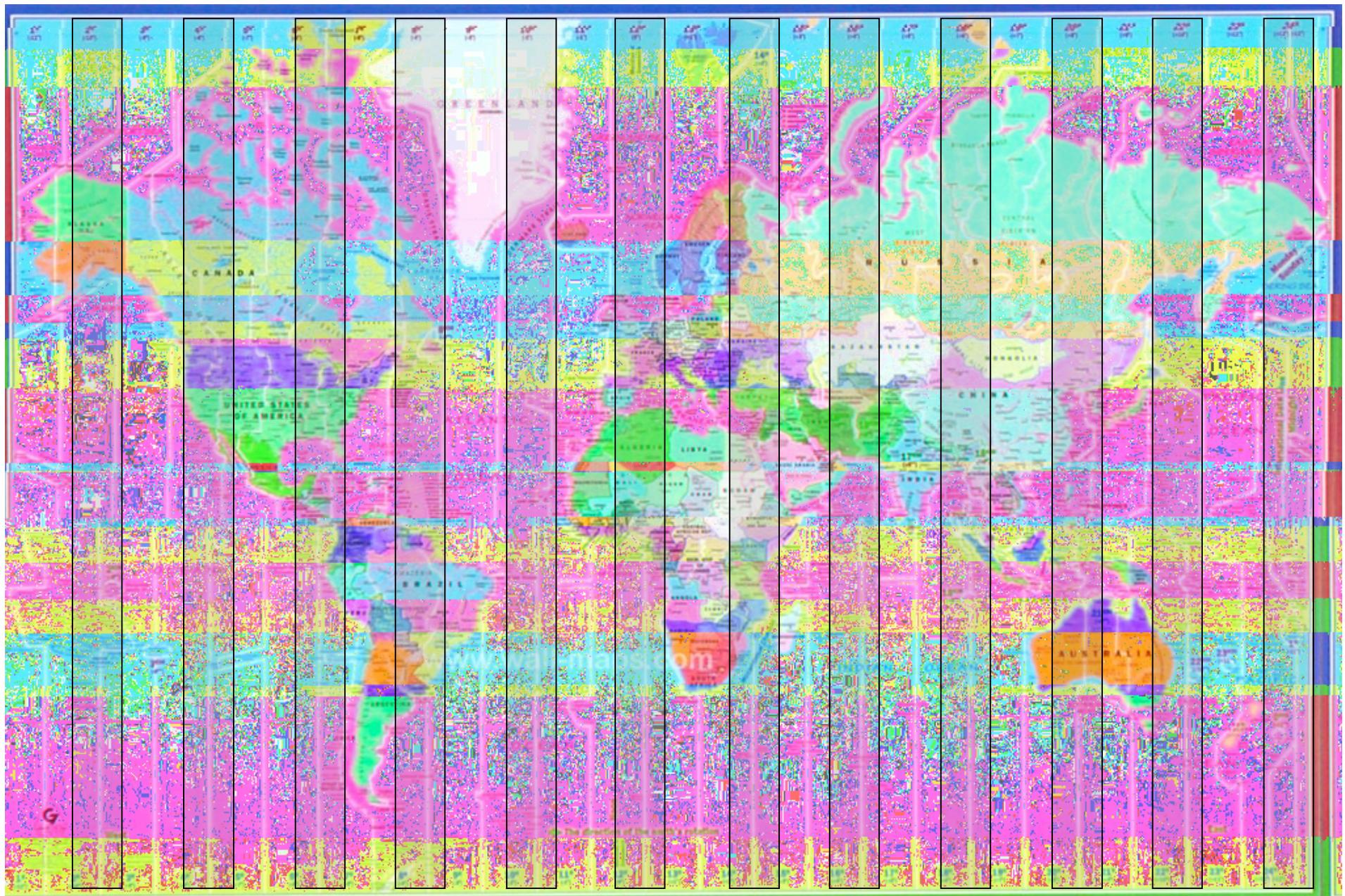
- Standard or “Nautical” time zones are 15 degrees of longitude wide.
- The first central meridian is the Prime Meridian,  $0^\circ$  E/W.
- The next central meridians are at  $15^\circ$ E and  $15^\circ$  W.
  - A town at  $6^\circ$  W pretends to be on the Prime Meridian, and sets its clocks to noon when the sun crosses  $0^\circ$  E/W.
  - A town at  $9^\circ$  W pretends to be at  $15^\circ$  W, and sets its clocks to noon when the sun crosses the time zone’s central meridian of  $15^\circ$  W.

120°W

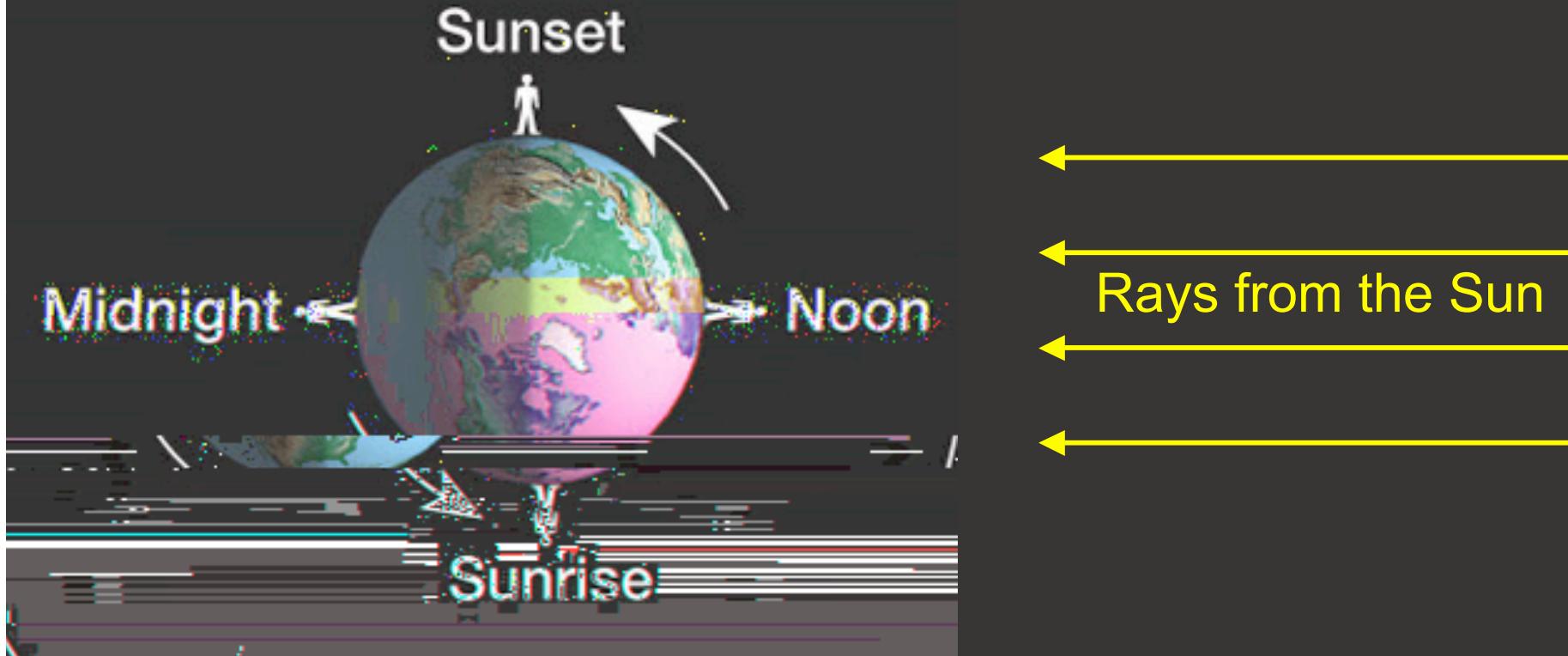
908W

0° E/W

180°



# Where is it earlier / later?



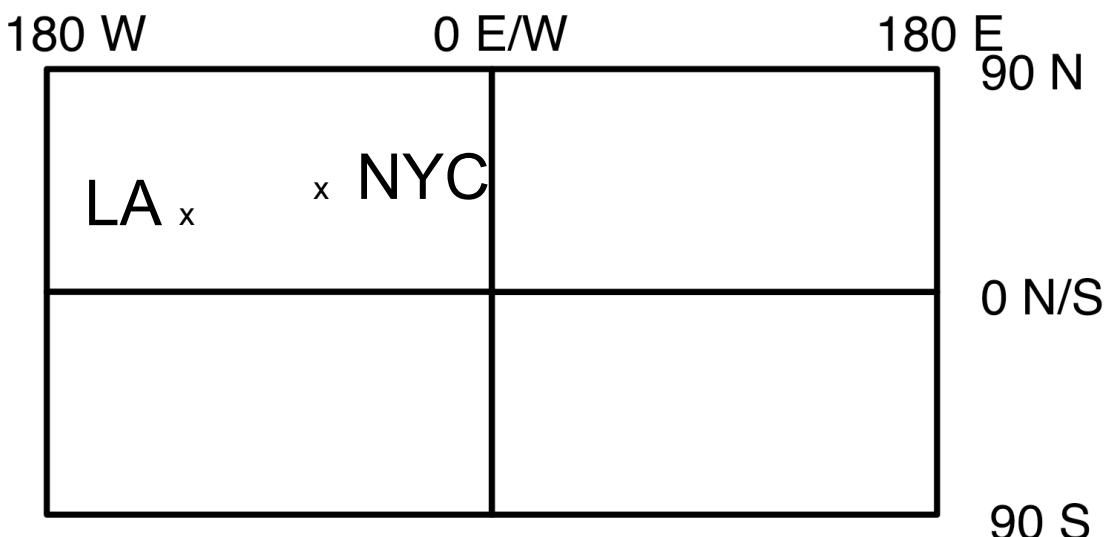
- Comparing two locations, the one to the East will experience noon before the one to the West.
- On the East Coast of the US it is already 3pm when it's noon in LA.

# Mechanics

- Time zones progress one hour later each  $15^\circ$  east
- one hour earlier each  $15^\circ$  west
- What happens to the date at midnight?
  - The date changes, right?
  - Same thing happens at the International Date Line
  - When it's 2:00 pm Monday at  $175^\circ\text{E}$ , it's 2:00 pm Sunday at  $175^\circ\text{W}$

# Sample problems

- When given a city location, you can orient yourself using a basic map like this one.
  - LA is at  $34^{\circ}\text{N} \times 118^{\circ}\text{W}$
  - NYC is at  $41^{\circ}\text{N} \times 74^{\circ}\text{W}$



# Sample problems

- What is the central meridian of LA?
  - LA is at  $34^{\circ}\text{N} \times 118^{\circ}\text{W}$
  - Closest number to 118 that is evenly divisible by 15 is 120 - so  $120^{\circ}\text{W}$
- What is the central meridian of NYC?
  - NYC is at  $41^{\circ}\text{N} \times 74^{\circ}\text{W}$
  - Closest number to 74 that is evenly divisible by 15 is 75 - so  $75^{\circ}\text{W}$

# Sample problems

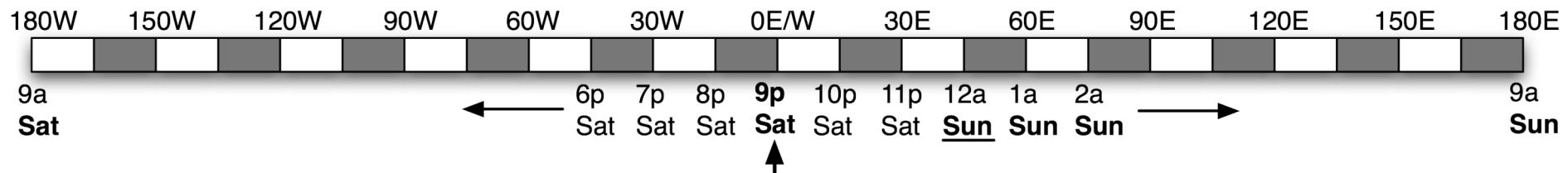
- What time is it in LA when it is noon in Greenwich, England on the Prime Meridian?
  - LA's central meridian is  $120^{\circ}\text{W}$
  - $120^{\circ}\text{W} / 15^{\circ}$  per time zone = 8 time zones
  - The time is earlier to the west, right?
  - Noon minus eight hours = 4 am in LA

# Sample problems

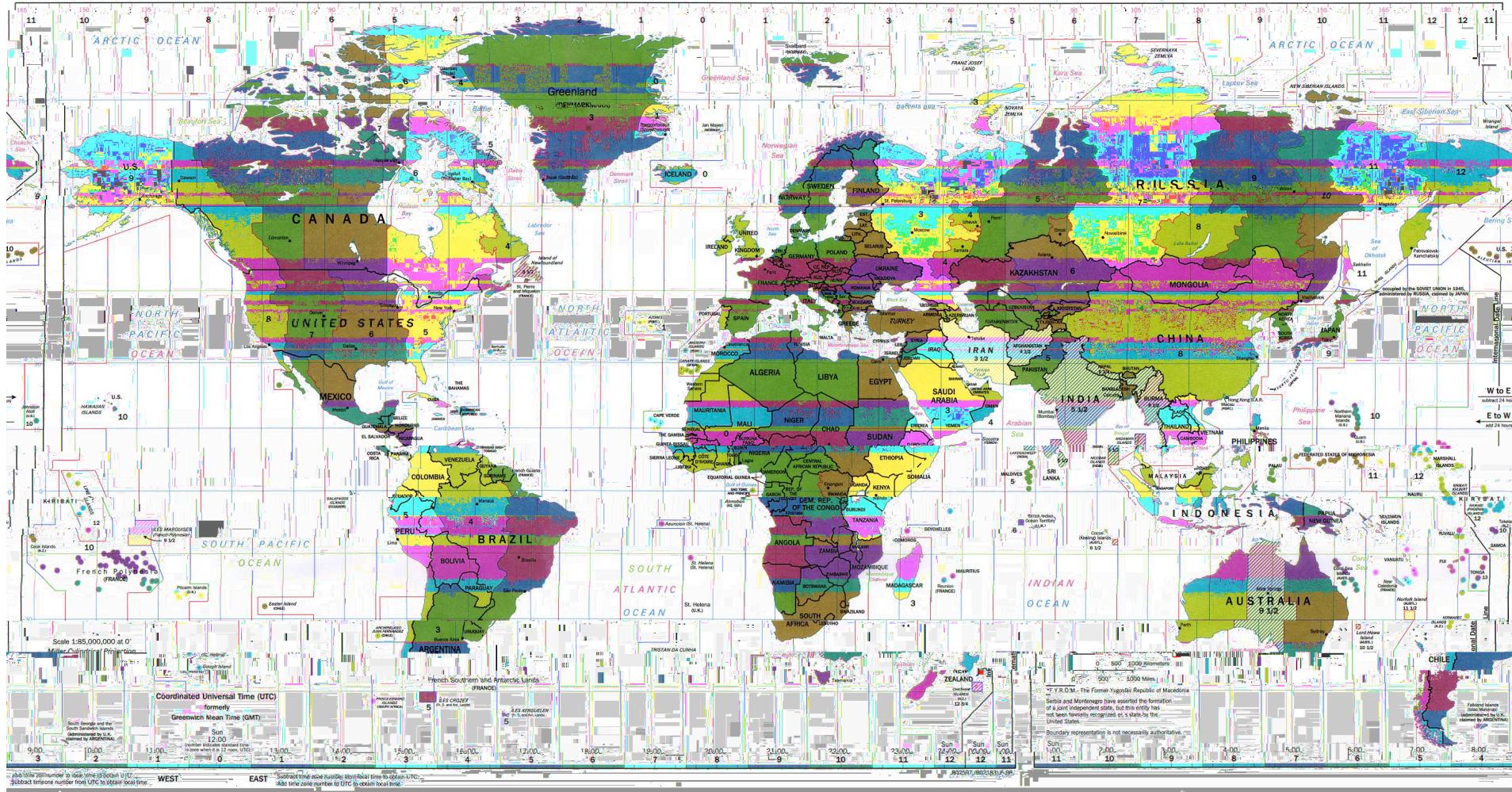
- What time is it in Greenwich, UK when it is noon in New York?
  - NYC's central meridian is  $75^{\circ}\text{W}$
  - $75^{\circ}\text{W} / 15^{\circ}$  per time zone = 5 time zones
  - The time is later to the east, right?
  - Noon plus five hours = 5 pm in Greenwich, UK

# Sample Problems

- Another way to do this is to use a number line marked in  $15^\circ$  increments.
- When it's 9pm Sat in Greenwich, it's 10pm one time zone east, and 8pm one time zone west.
- Note that the time zone centered on  $45^\circ\text{E}$  has switched to the next day



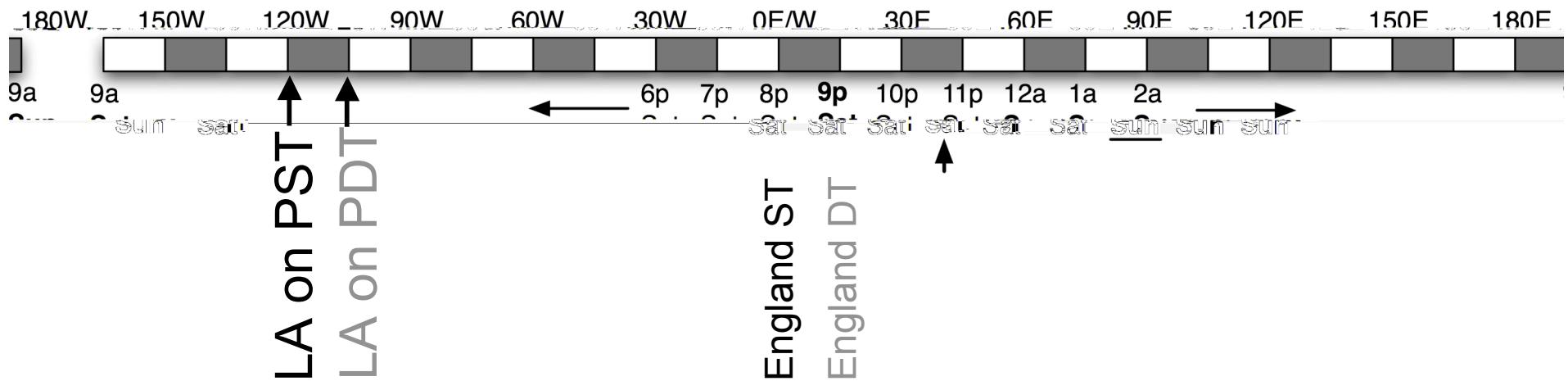
Standard Time Zones of the World



- Time zone boundaries on land are usually distorted to match political boundaries.

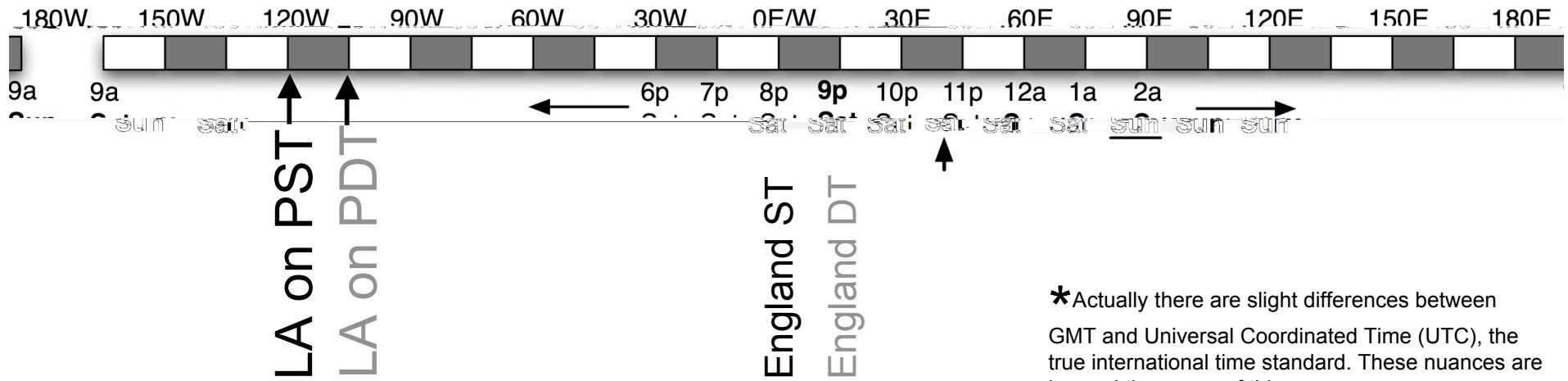
# Daylight Savings Time

- We pretend to live  $15^{\circ}$  east of actual
- The central meridian for LA on Pacific Standard Time (PST) is at  $120^{\circ}\text{W}$ , but we use  $105^{\circ}\text{W}$  (Denver) on Pacific Daylight Time (PDT)



# Daylight Savings Time

- Greenwich Mean Time (GMT) is the standard by which all world clocks are set.\*
- GMT *never* switches to daylight time.
- PST = GMT – 8 hours
- PDT = GMT – 7 hours



\*Actually there are slight differences between GMT and Universal Coordinated Time (UTC), the true international time standard. These nuances are beyond the scope of this course.

# Daylight Savings Time

- We use daylight savings time in the spring and summer (March/April - October)
- We use standard time in late Fall and Winter, when days are shorter
- All countries that use daylight time do so in their summers, though the dates that they spring forward and fall back differ.
- Remember that summer in the southern hemisphere occurs during our winter and vice versa.

# Conclusions

- Time zones are a function of longitude
- Nautical time zones are  $15^\circ$  wide
- Actual time zones on land are gerrymandered to match political boundaries
- Time differences can be calculated on a number line