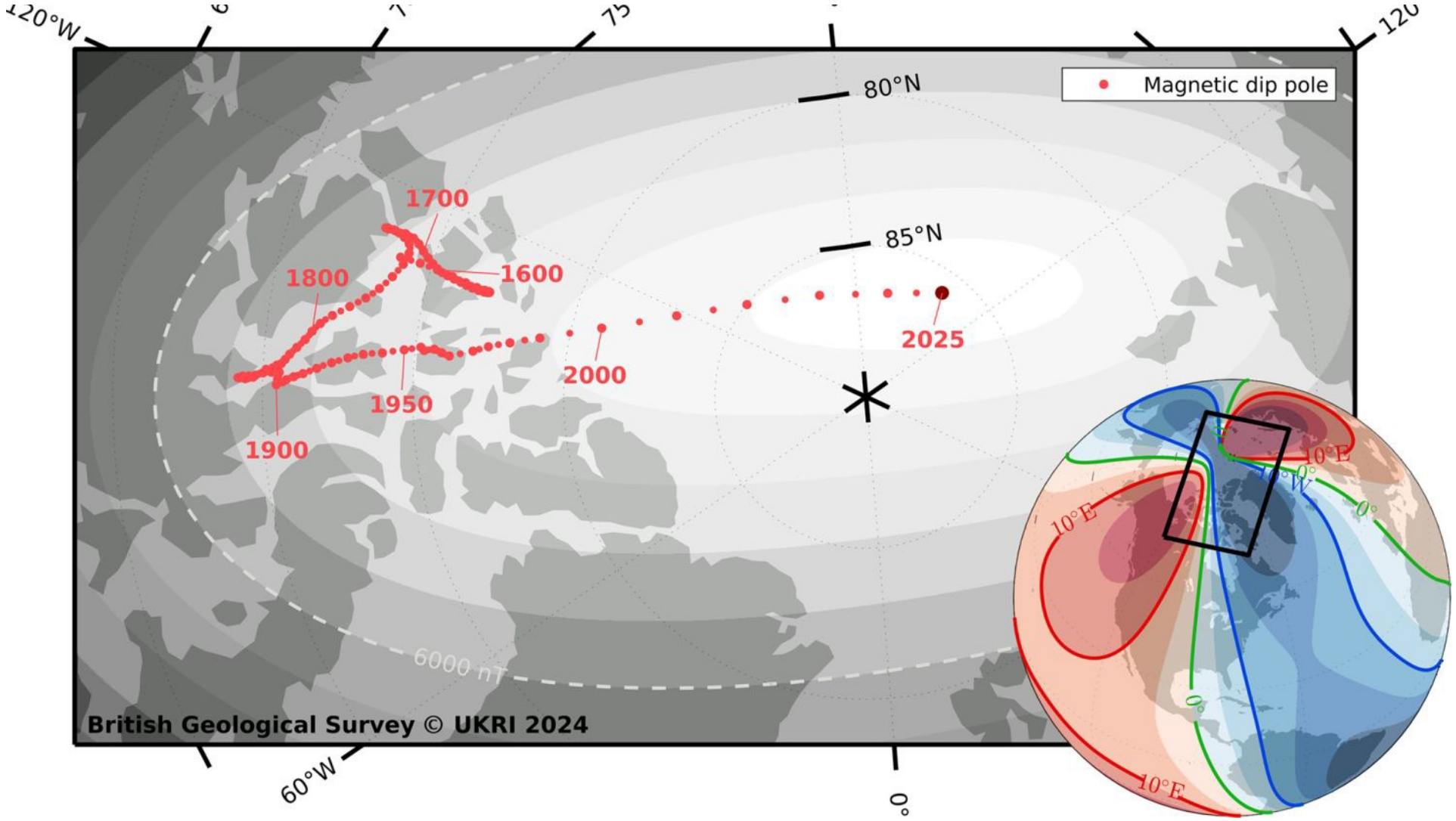
PHYS 122-Lecture 14:
EM Waves

- Final Exam Date/Logistics
- Review Session?
- Today: Exam 3 Results
  The magnetic poles
  “5-sec rule” and power-cycling
  EM Waves from Maxwell’s Equations


Magnetic South Pole
1,800 miles
from true South


120°W
75
120
80°N
85°N
Magnetic dip pole
1700
1800
1600
2025
2000
1950
1900
6000 nT
British Geological Survey © UKRI 2024
60°W
0°
10°E
0°
10°E
0°
10°E

In most modern electronics:

- Inductors have values that typically range from 1 µH to 20 H.
- Capacitance values are typically between 1 nF and 1 µF
- Resistors (E3) have the following three values; 1.0, 2.2, and 4.7.
  (This means that E3 resistors can have a resistance of 1Ω, 2.2Ω, or 4.7Ω.)

MAX τ for LR circuit is then: L/R, or 20/4.7 = 5 sec

MAX τ for RC circuit is then: RC, or 1µF * 5 = 5µs

5-sec rule comes from LR circuits.

Maxwell's Equations To Date

$$\oint \vec{E} \cdot d\vec{a} = \frac{q_{enc}}{\epsilon}$$

Gauss' Law

$$\oint \vec{B} \cdot d\vec{a} = 0$$

"No Name Law"

$$\oint \vec{B} \cdot d\vec{\ell} = \mu I_{enc} + \epsilon\mu \frac{\delta}{\delta t} \oint \vec{E} \cdot d\vec{a}$$

Ampere's Law
w/ Maxwell's Correction

$$\oint \vec{E} \cdot d\vec{\ell} = -\frac{\delta}{\delta t} \oint \vec{B} \cdot d\vec{a}$$

Faraday's Law