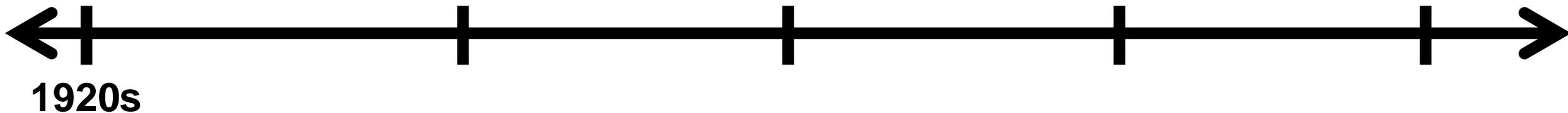
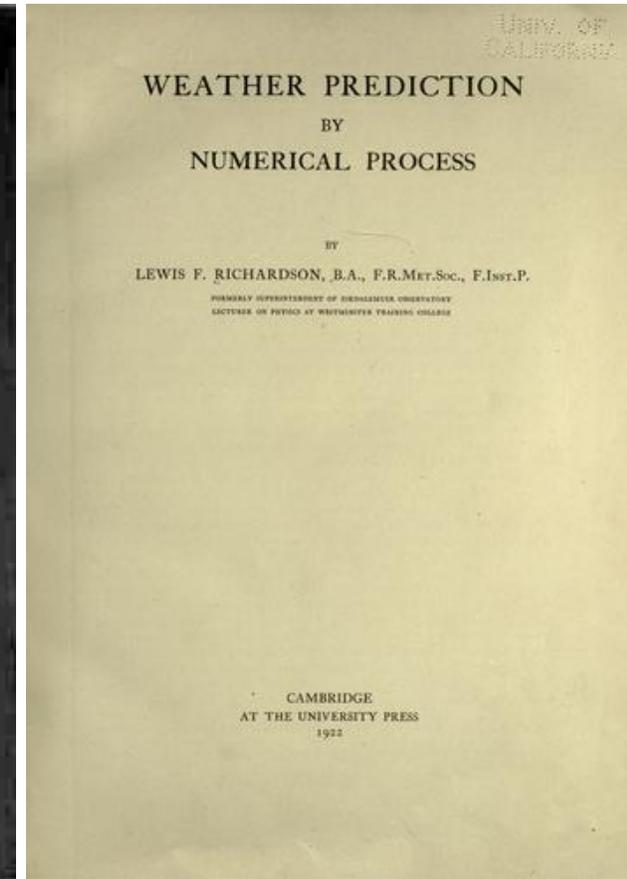


Numerical Weather Prediction

- “The integration of the governing equations of hydrodynamics by numerical methods subject to specified initial conditions” - AMS Glossary
- “The one area in which our predictions are making extraordinary progress, however, is perhaps the most unlikely field... The holy grail of meteorology, scientists realized, was dynamic weather prediction — programs that simulate the physical systems that produce clouds and cold fronts.” Nate Silver - *The Signal and the Noise: Why So Many Predictions Fail — but Some Don't*
- NWP requires trade off between speed and accuracy. Forecast must be finished soon enough to be useful for prediction

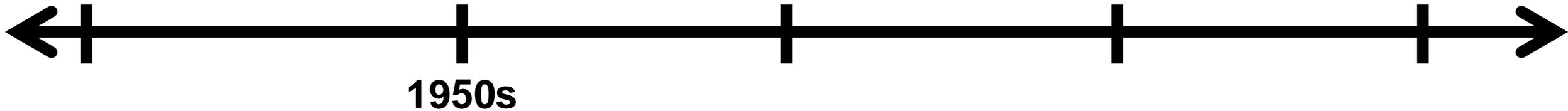
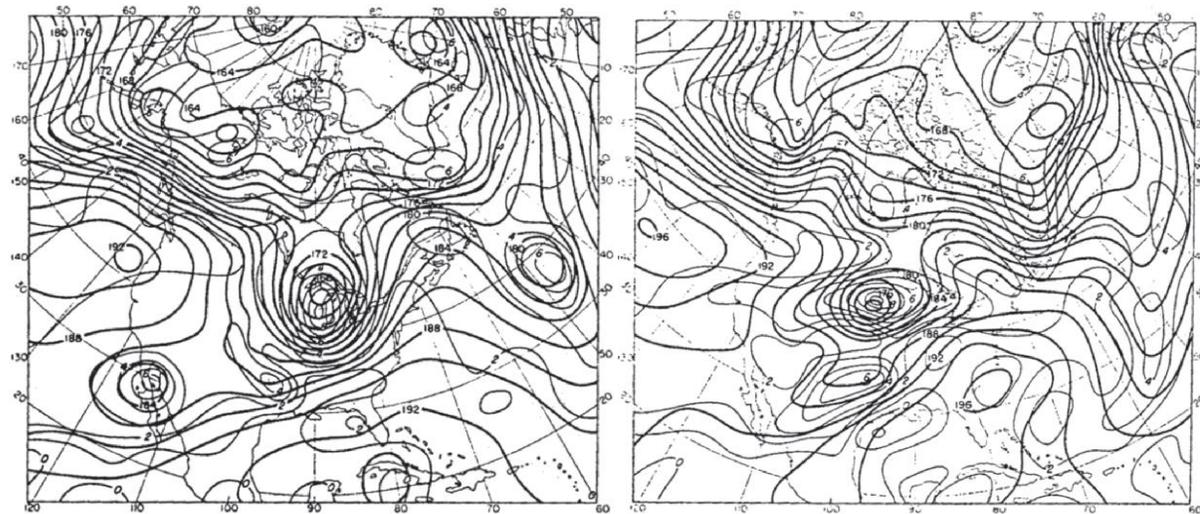
History of NWP

- Lewis Richardson the first to propose numerical weather prediction based on equations of motion (1922)
- Proposed having room of people who are carrying out calculations and passing around results via a “conductor”
- Estimated it would take 60,000 people to carry out



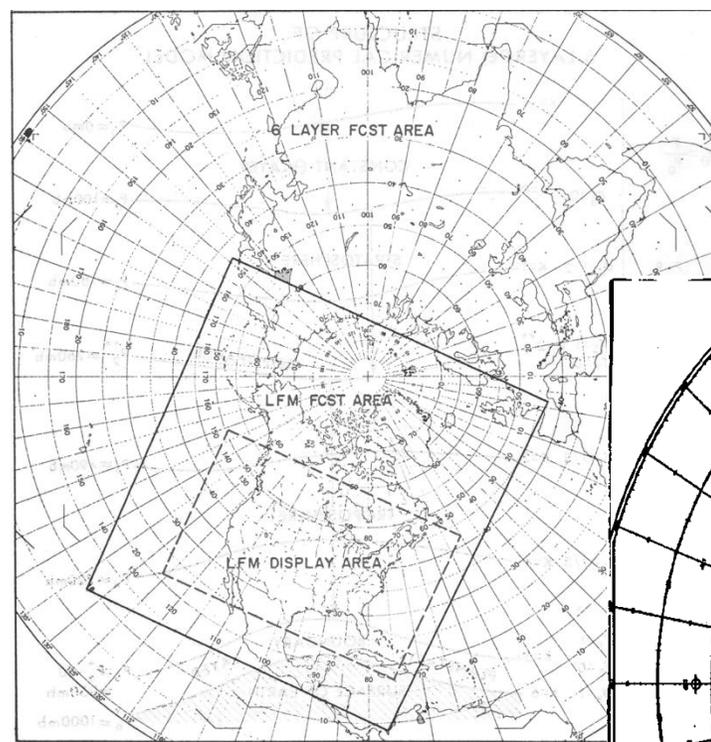
History of NWP

- Fjortoft and vonNeuman: First forecast using one-layer model (1949)
- Charney: First full equation forecast on one level using ENIAC (1951)
- First operational NWP forecast in Sweden (BESK; 1954)
- Lorenz identifies chaotic properties of the atmosphere (1961)

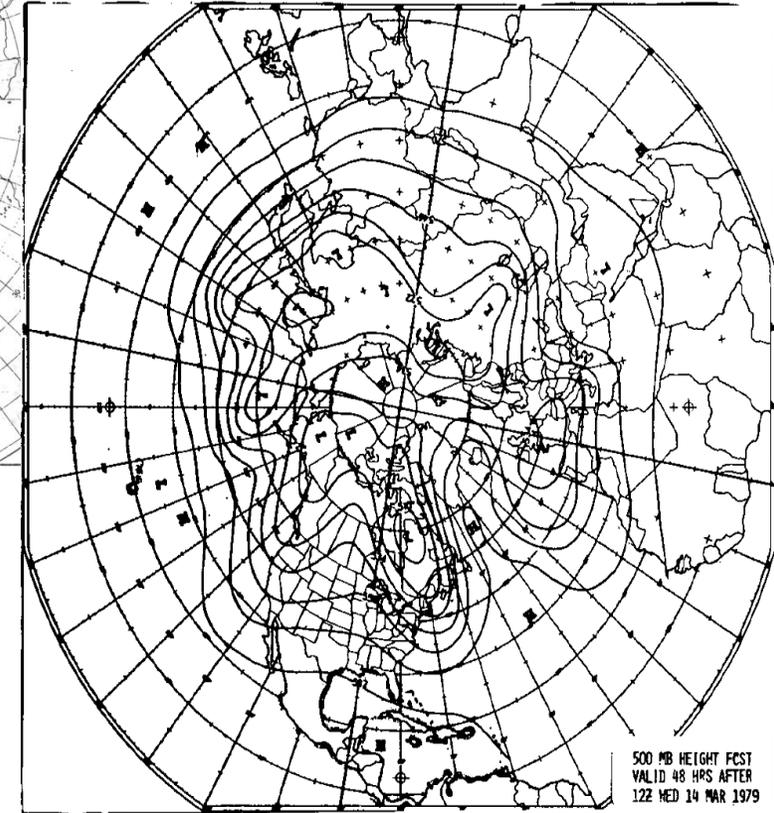


History of NWP

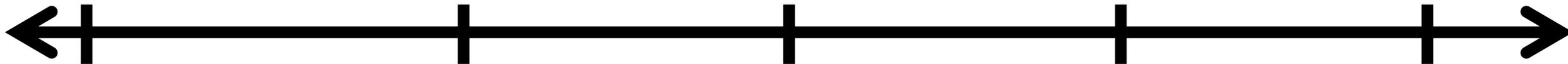
- Limited-area model (LFM) 1971
 - 190 km resolution
 - 24 h forecast
 - 6-layer primitive equation model
- First global model in US (1980)
 - R30 (~250 km)
 - 48 h forecast
 - 12-layer full physics model



NOAA TPB-67



Sela 1980



1970s