Dissertation Outline

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1. Introduction
   1. Brief overview of topics that will be covered and why should you care statement.
   2. Review of the “Motion of Charged Particles in E&M Fields”
      1. Cyclotron and J1
      2. Bounce and J2
      3. Drift and J3
      4. **E**x**B** drift
   3. Magnetosphere structures and particle populations. Solar wind to magnetotail
      1. Show an overall schematic
      2. Solar wind interaction with magnetosphere. Bow shock, magnetopause, magnetotail, etc.
      3. Solar wind penetration via reconnection, dragging of field lines to make dawn-dusk **E.**
      4. Earth’s co-rotating field creates inward **E**. Find a good derivation
      5. Potential due to the **E** fields creates a region of stably trapped particles, the plasmasphere that is replenished from the ionosphere (describe the two ionization processes).
      6. Mention the coordinate system (L, MLT, mag lat) we use in the dipolar region**.**
      7. Describe the next higher energy population (ring-current) from injections of particles from the tail.
      8. Describe the radiation belts
   4. Sub-storms and storms
   5. Review particle acceleration mechanisms
      1. Radial diffusion into the inner magnetosphere
      2. Electron cyclotron heating
   6. Review particle loss mechanisms
      1. Losses via magnetopause shadowing.
      2. Define the loss cone.
      3. Losses via EMIC wave scattering.
      4. Losses via whistler mode chorus wave scattering
      5. mention microbursts
      6. Show the Thorne wave plot and emphasize that a particle can encounter all of those waves in one drift period.
   7. Microburst background
   8. Scope of research section to lead into the instrument chapter and rest of the disserataion.