What are the most important problems to address?

- What are the causes and consequences of along-strike and long-term variability?
  - How have the volcanic and fault systems developed as the plate boundary evolves through time?
  - Temporal changes in deformation (long and short-term) and their relation to along-strike changes along margin?
  - How and why does a subduction interface transition from locked to aseismic creep? How are the physical conditions on the interface different from an area of stick-slip to slow slip/aseismic creep?
  - What leads to diversity of slow slip event behavior?
  - Climate-tectonic feedbacks?
  - How are all of these changes interrelated?

Advantages

- strong systematic, along-strike transitions in a variety of subduction margin characteristics
- structural changes of the incoming plates
- changes in sediment input/budgets
- changes along the volcanic arc (volatile/mass/silica content), and across the margin from the forearc through to the arc

- How do we use modern observations in conjunction with geologic data/models to understand subduction initiation?

NEW ZEALAND IS IDEAL FOR AN AMPHIBIOUS APPROACH
Datasets that already exist:
• Source-to-sink data exist here
• Long-term stratigraphic/magmatic/paleoseismic history
• Continuous GPS
• Extensive 2D offshore seismic data
• Extensive passive seismic network/earthquake catalogs
• Geochemical from springs and seeps in forearc
• Highres bathymetry
• Some core data but not extensive
• Industry drill-hole data (with possible buy-in?)
• QMAP data
• BSR Heat flow
• Magnetotelluric data (minimal), but NZ effort in this is ramping up
• Local earthquake tomographic models
• Onshore/offshore refraction transects
• Geochemical monitoring of magmatic activity
• Great physical volcanology record
• Paleo shoreline mapping

Datasets that are needed:
• 3D seismic reflection along the slow slip source area
• Wide-angle refraction
• Drilling northern Hikurangi offshore margin
• Turbidite/tsunami history
• Offshore geodesy (pressure sensors or GPS-acoustic systems)
• Heatflow measurements
• Improved onshore/offshore passive seismic network/data
• Dense array seismic networks
• Strain and tilt meters to evaluate smaller slow-slip events
• Improved fluid flow measurements offshore
• More magnetotelluric data, possible continuous MT?
• Focused geophysical transects across the along-strike transition from locked to creeping (south to north)
• Cores and seismic data to eval. SI
• Geologic/geochron/geochem documentation SI
• 3D seismic to image slab SI (proposal submitted—Gurnis)
• Drilling SI
• More bathymetry? SI
• More continuous GPS
Infrastructure and Leverage:

• GeoNET
• Volcano Observatories, monitoring (seismicity, deformation, geochem)
• GNS/NIWA/Universities, dynamic earth science community
• Substantial Government support, EQC
• Good ports
• Potential for industry buy-in (geothermal, petroleum)
• International communities interested (Japanese/Germans)
• Societal support and implications
• Long field seasons
• Language isn’t tooo difficult!
• Marine Geophysical vessels available locally
• IODP drilling vessel will be ‘around’ in 2013
• Good wine