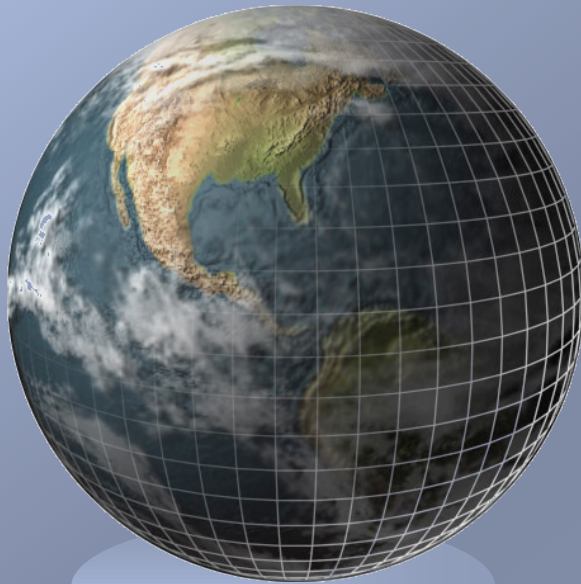


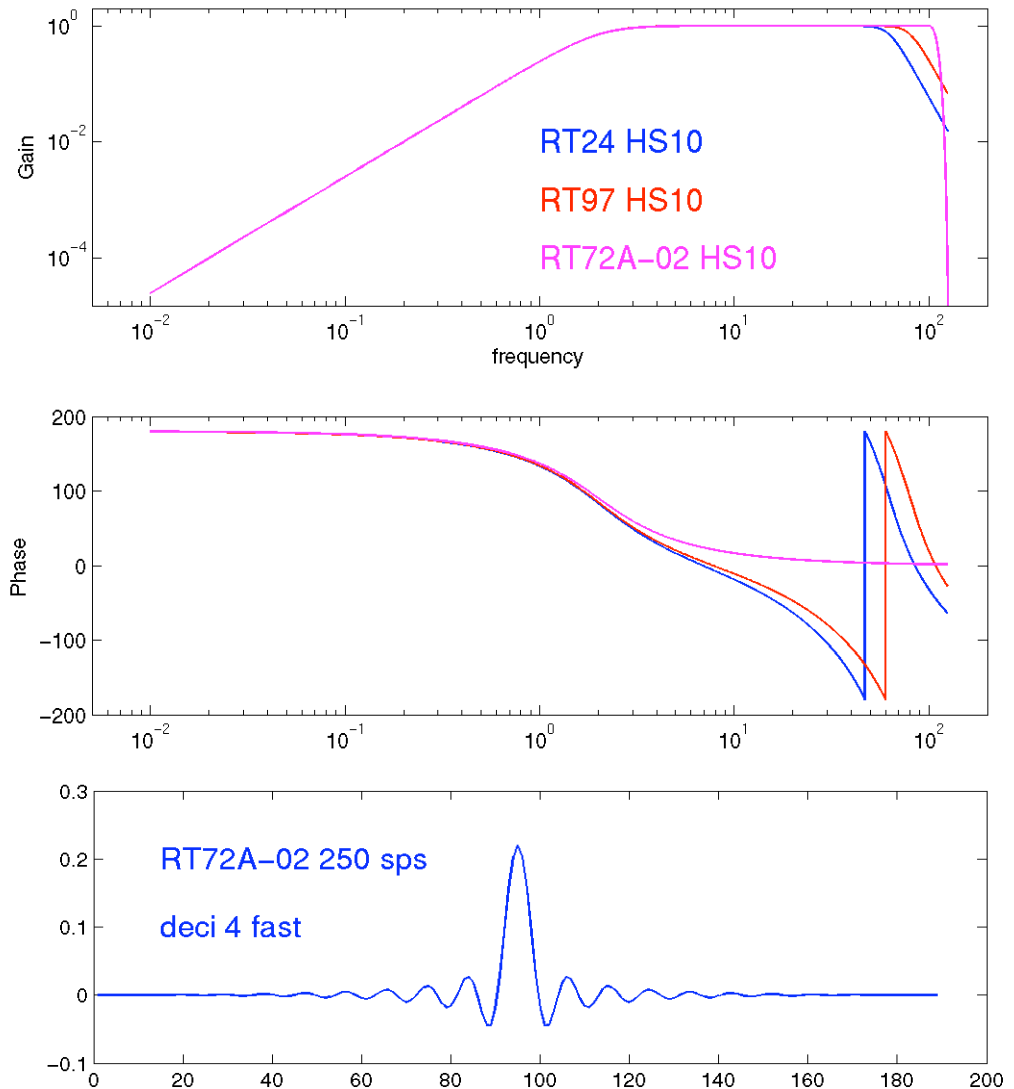
Magnitudes



Taimi Mulder
PGC
Sidney, BC
11 June 2006

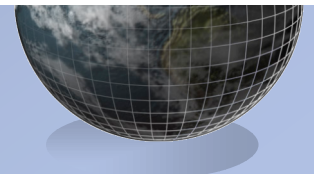
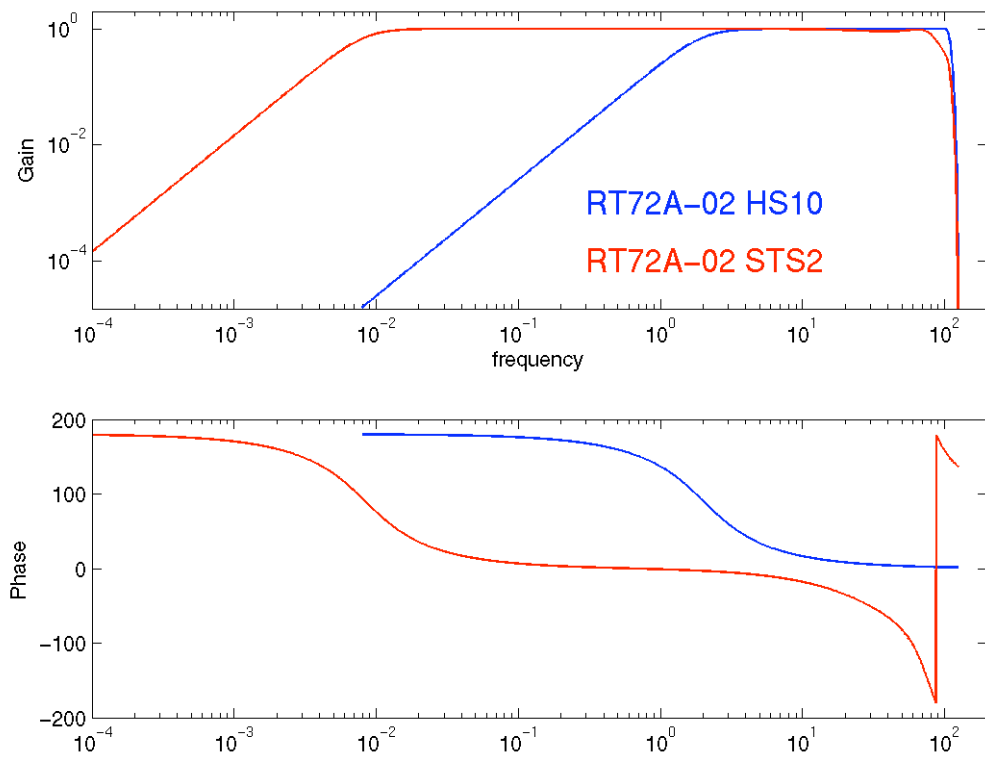
When life was simple

- Sensor
 - 2 Poles
 - -8.886×10^1 8.886×10^1
 - -8.886×10^1 -8.886×10^1
 - 2 Zeros
 - 0.0000×10^0 0.0000×10^0
 - 0.0000×10^0 0.0000×10^0
- Anti-alias filter
 - 6 Poles
 - -3.793×10^3 0.1016×10^3
 - -3.793×10^3 -1.016×10^3
 - -2.777×10^3 0.2777×10^3
 - -2.777×10^3 -2.777×10^3
 - -1.016×10^3 0.3793×10^3
 - -1.016×10^3 -3.793×10^3
 - 0 Zeros



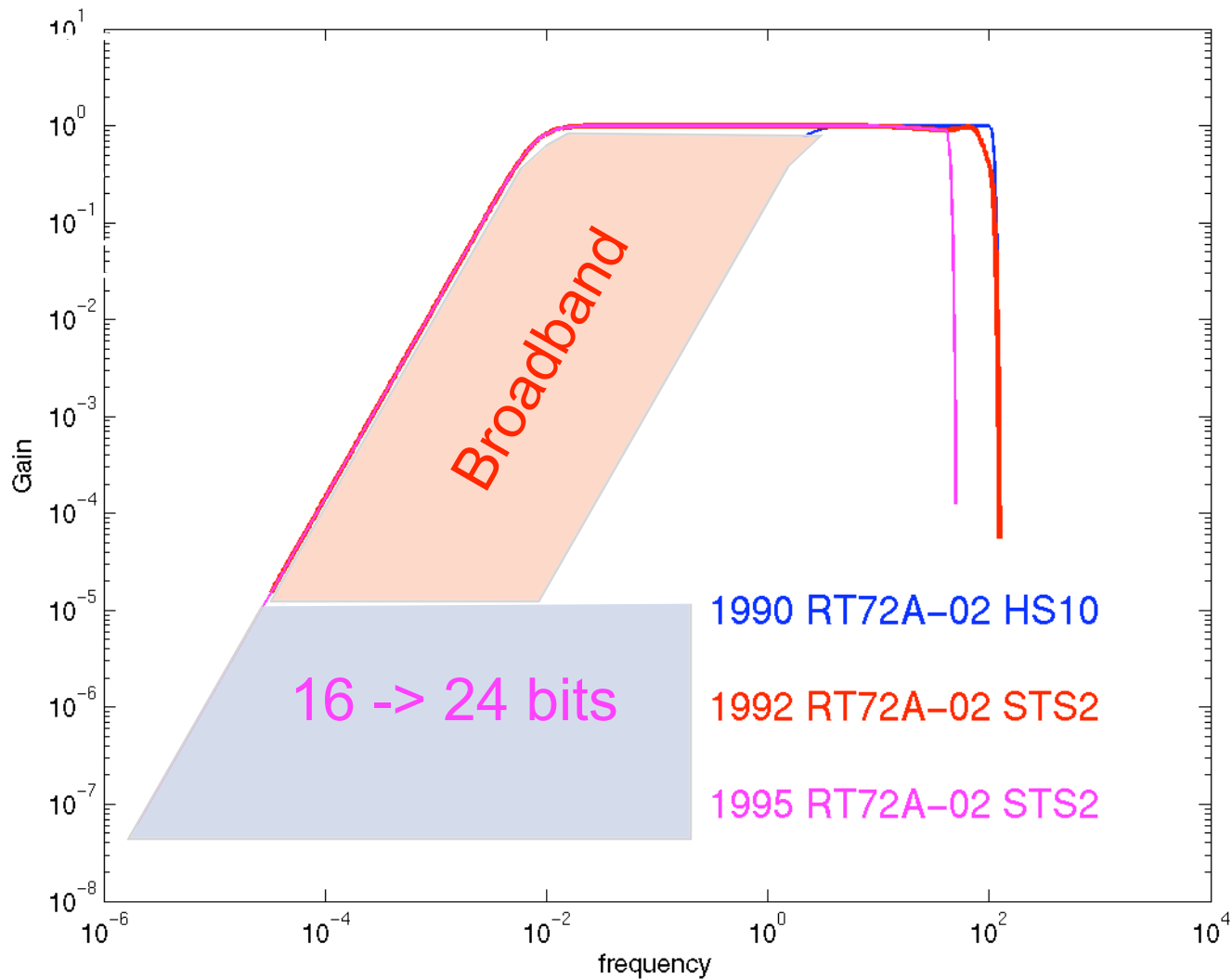
New Frontiers in Bandwidth

- Datalogger
 - RT72A-02
 - 16 bit (96 db)

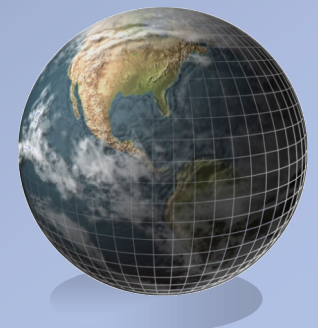
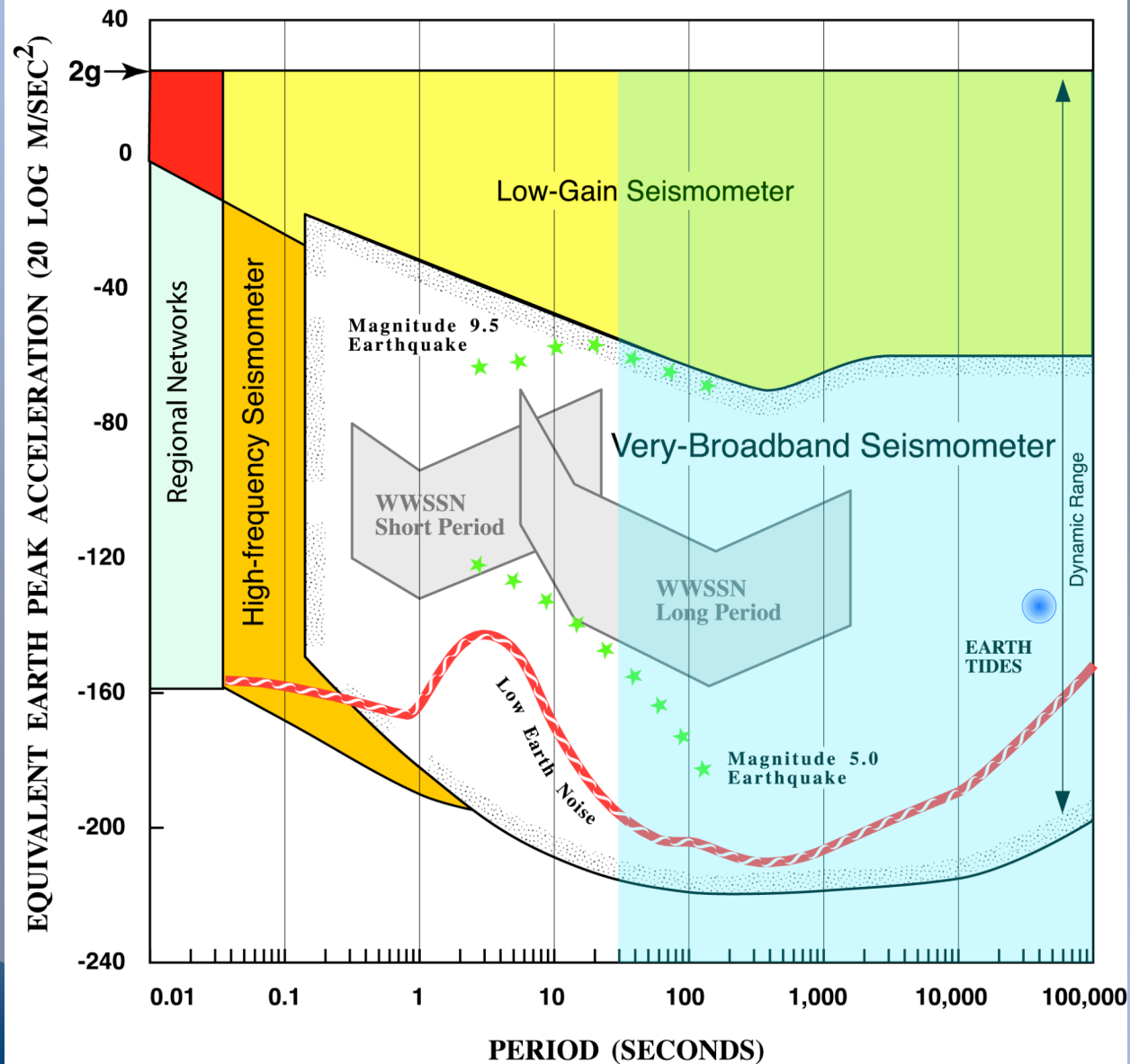


New Frontiers in Dynamic Range

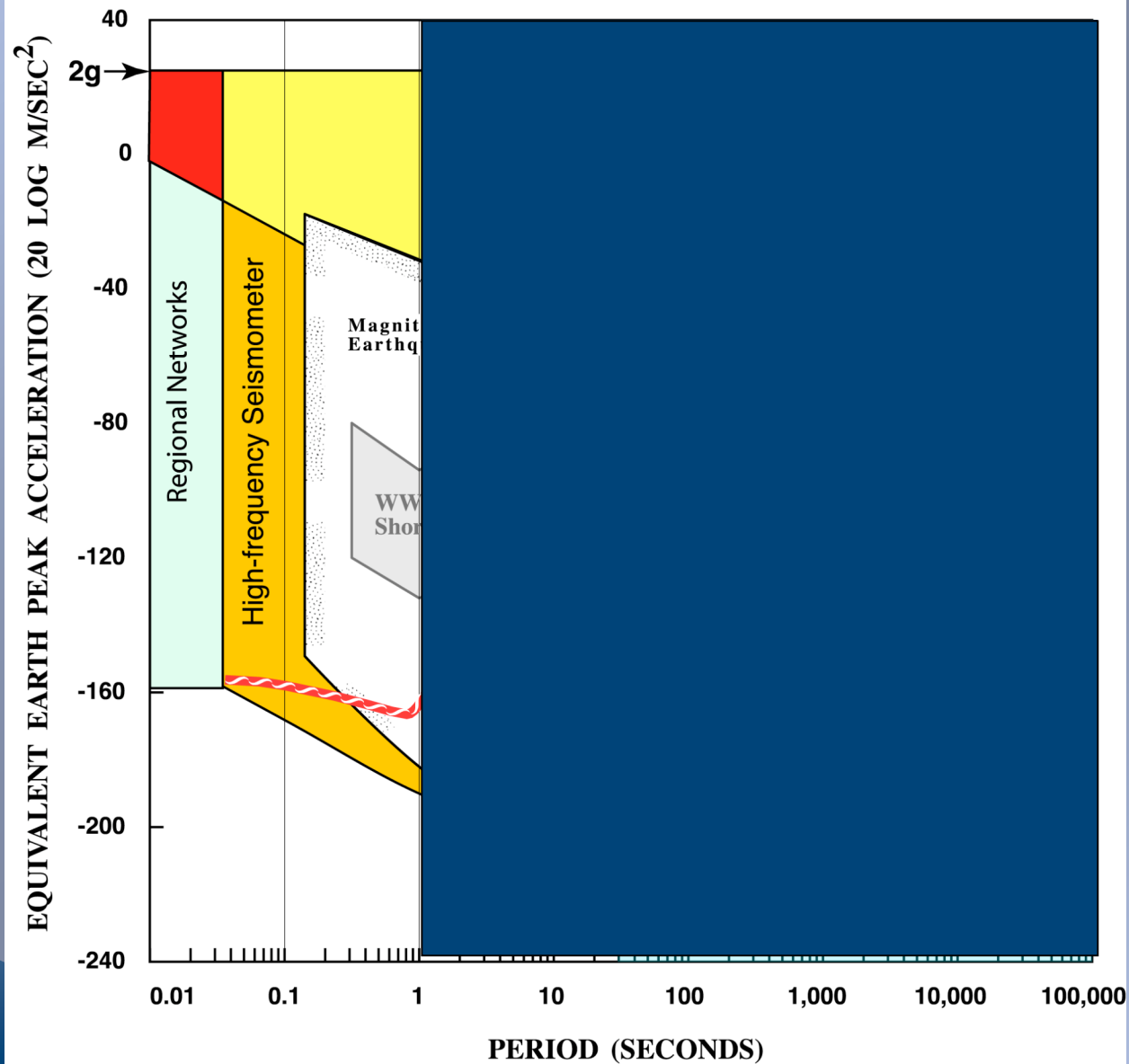
- S



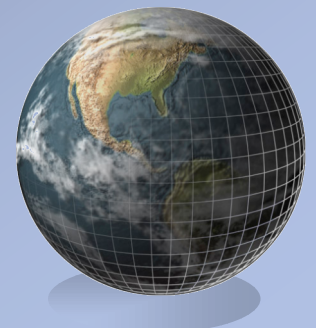
Passive Seismology Observational Range



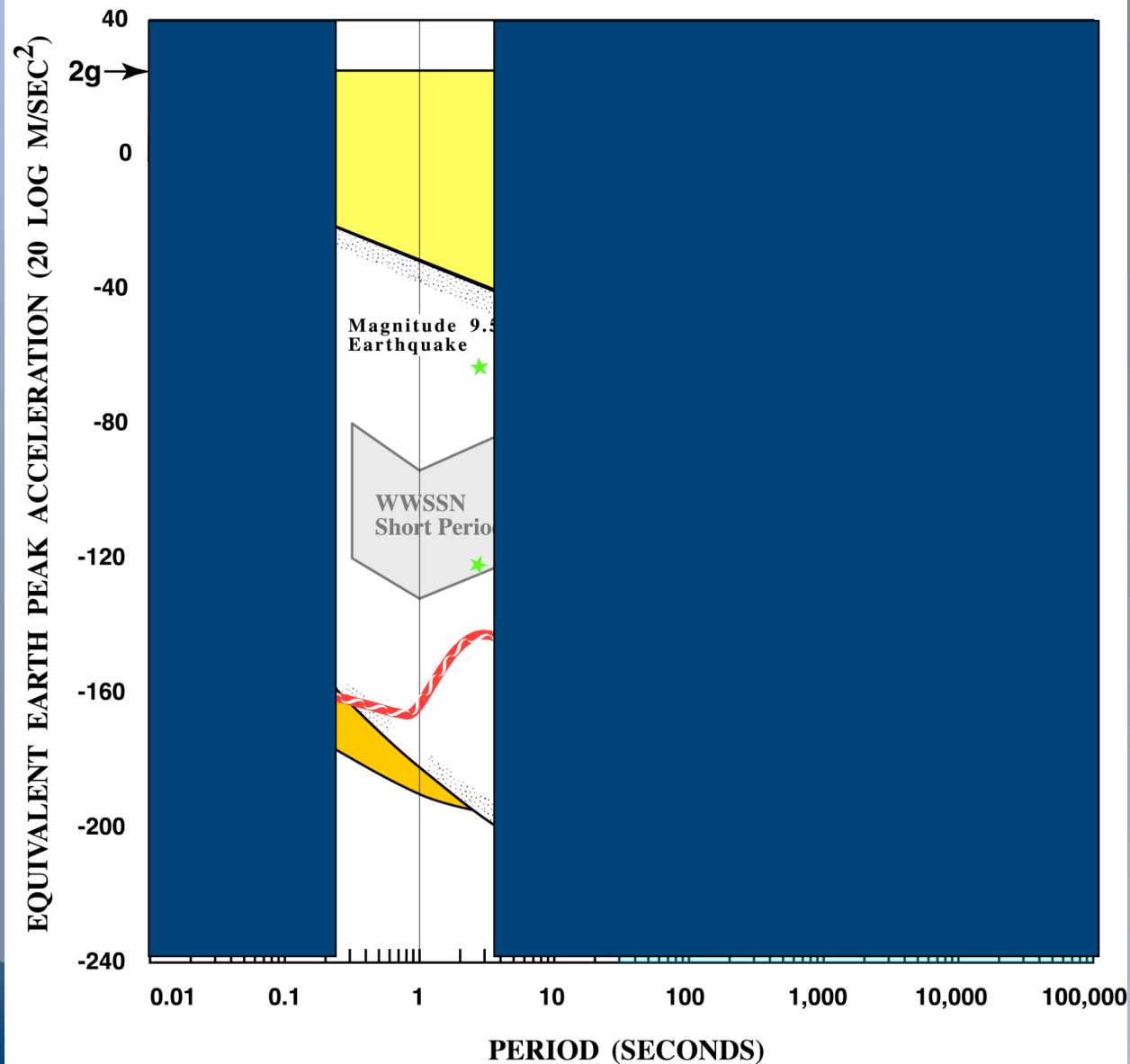
Passive Seismology Observational Range



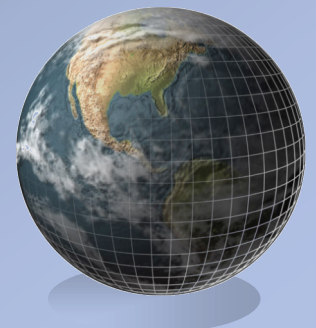
Local
Magnitude



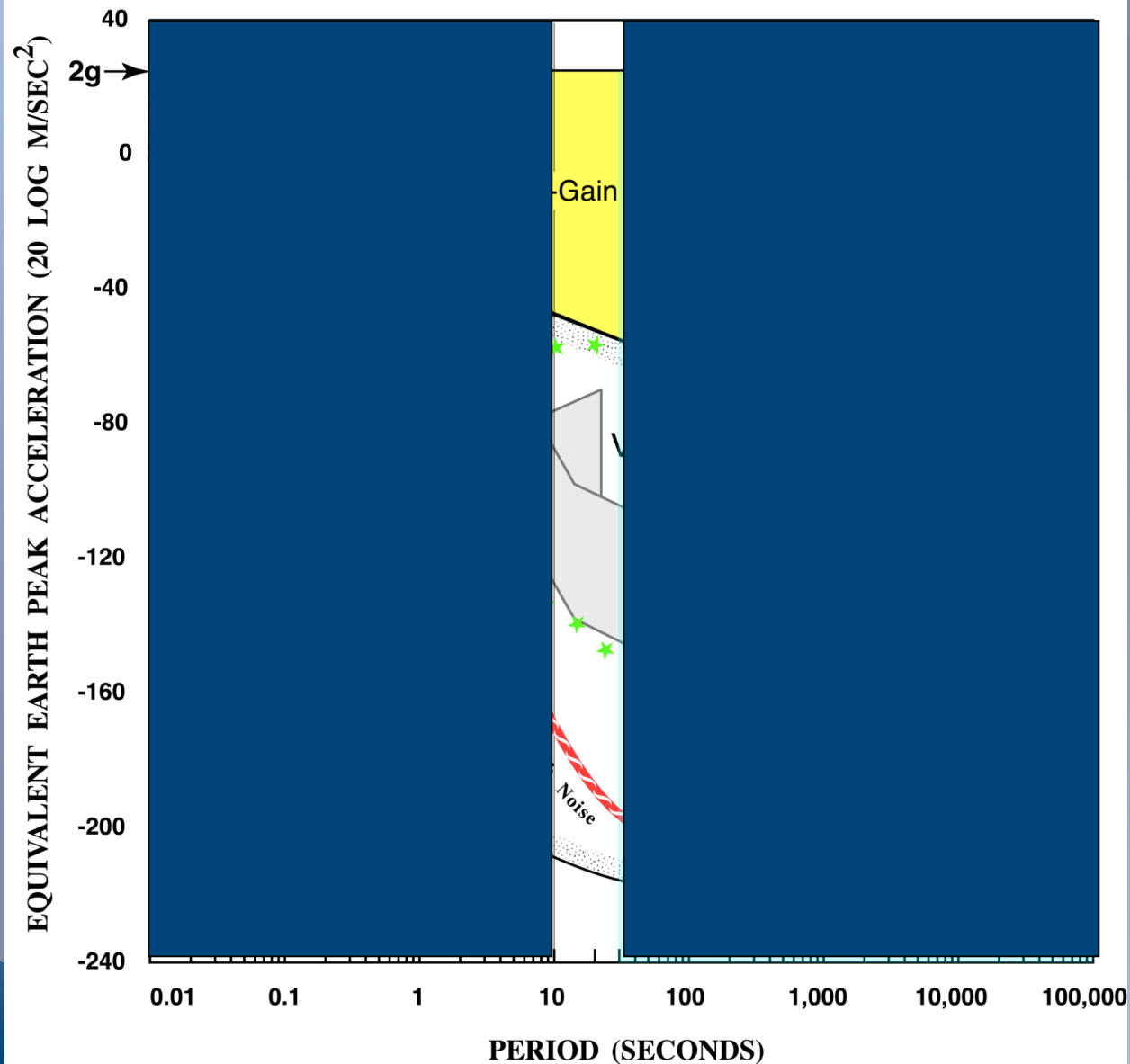
Passive Seismology Observational Range



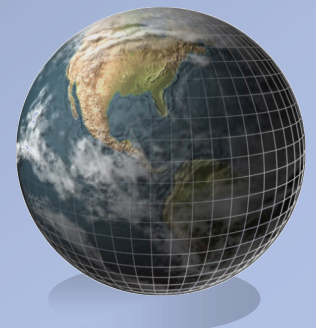
Body
Wave
Magnitude



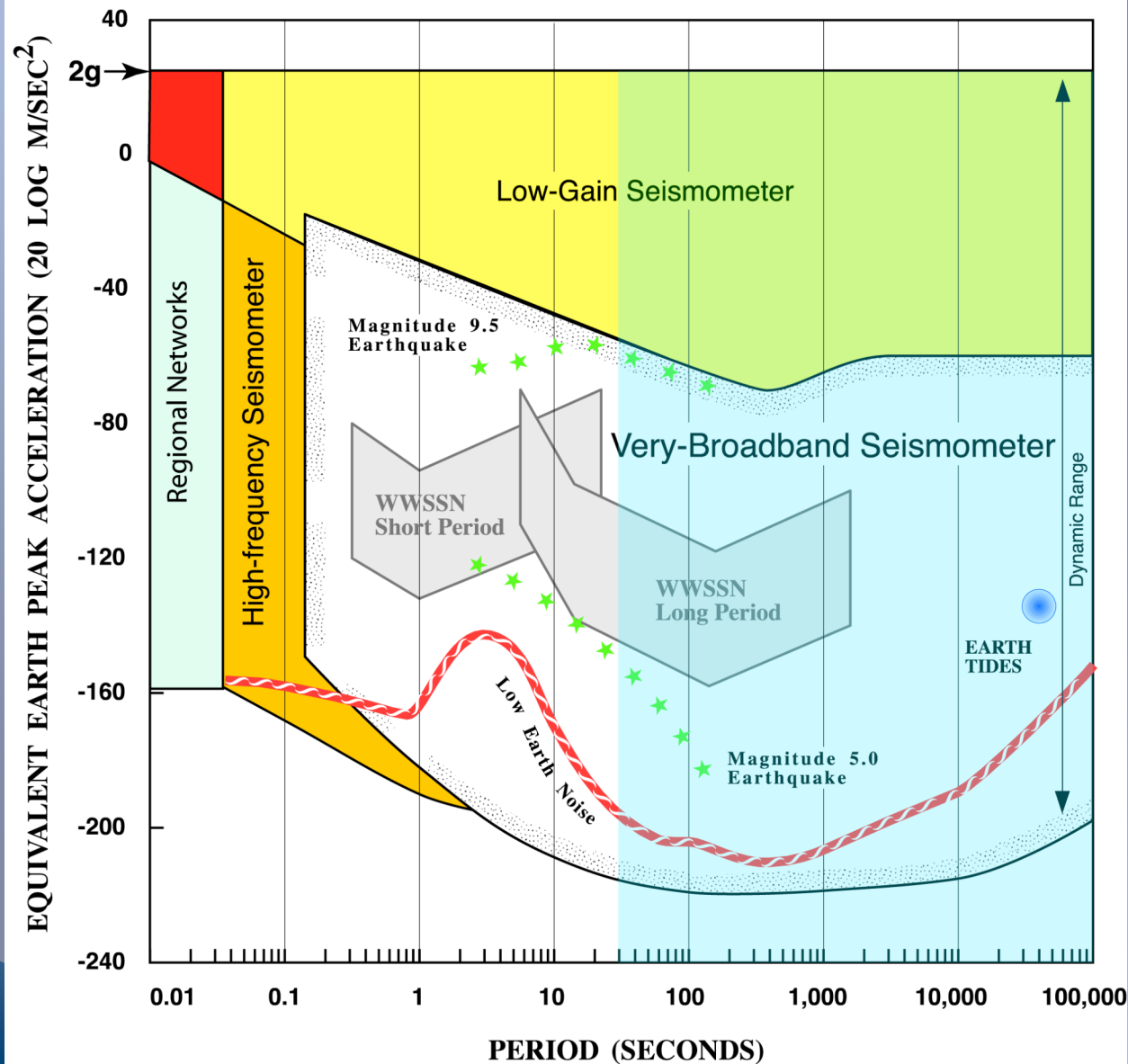
Passive Seismology Observational Range



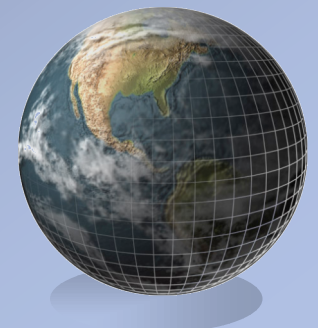
Surface
Wave
Magnitude



Passive Seismology Observational Range



Moment
Magnitude



Programs

- dbml (ML)
- dbampmag (ML, mb, Ms: calculated on phase of choice in displacement domain)

$$c_0 + \log_{10}A + c_1*\log_{10}\Delta + c_2\log_{10} (\Delta*c_3+c_4) + c_5$$

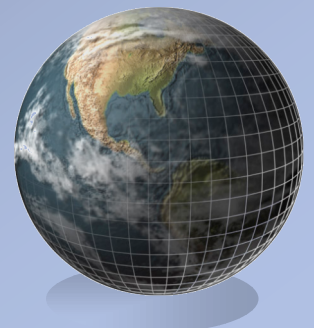
- dbml_mag (aussie mag program)
 - similar to dbampmag - includes Δ^2 term; records amplitude and time in arrival table for each stn allows multiple types of ML (varying A_0)
- aeic_dbml (alaska mag program)
 - lists stn mags and allows user select mags for netmag calculation

- dbmag, dbms



Summary of existing magnitudes

- ML, mb, Ms
- Note: ML(Sn), mb(Lg)=MN capabilities exists in dbampmag



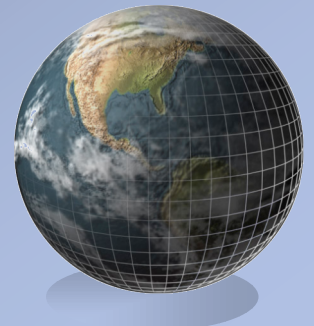
Magnitudes missing or not fully developed

- M_w

- RMT: in development, uses Chuck Ammon's RMT code.

- CMT: doesn't exist

- M_d/M_c – see dbmag?



Factors affecting your magnitudes

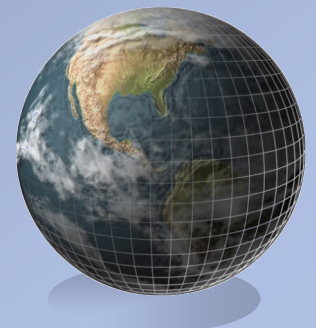
- *s/n ratio (actually a detection problem not a mag problem)*

- off or on (set cutoff value in pf)

- *calib*

- all these programs use calib from either the calibration or wfdisc tables.

- calib must be correct: check sensor and digitizer, check instrument response from which calib is calculated.

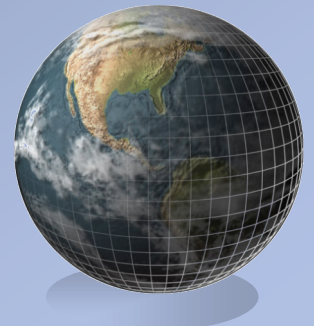


- *time factor*

- dependent on waveform attenuation in region
- dependent on station distance from hypocentre
- constant*(S-P), commencing at predicted P (dbml) or centered around arrival time of phase of interest (dbampmag)

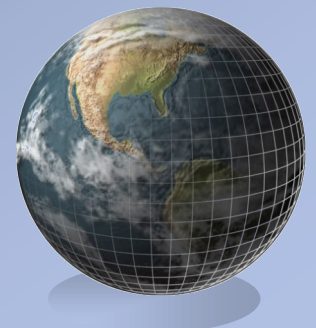
- *magnitude equation*

- note: dbampmag and dbmlmag are the only programs which allow user to specifically set the constants for distance attenuation, site specific effects, etc.



Issues

- Representing magnitudes in css3.0 tables
 - stamag
 - netmag
 - origin table only allows 3 mag types (ml, mb, ms)
 - antelope programs such as dbloc2 origin display get mag from origin table
 - origins with alternate mags such as Mw, Mb(Lg), etc. will need a netmag entry for each mag (outer join of origin with netmag)
- Catalogue mag adjustments
 - mags consistently high or low in a region



Questions

1. Are there other factors or hidden assumptions affecting magnitudes?
2. Difficulties with existing programs
 - dbmag
 - dbampmag
 - dbms
 - dbmw
3. Do any of the above meet our needs with some modifications? What are the modifications?

