

MSC Columbus' eggs



P. Ruggi ((())) Weekly meeting 20-06-2007



outline

• EQG • µSFR





EQG EarthQuakeGuardian



A fact : Earthquakes reduce the duty cycle Why : GIPC is good during windy days/ is bad during Earthquakes The aim : to reduce EQ unlock rate by 70-80%



((O))

GIPC YES/NO

As long as the disturbance is at low frequency and localized, GIPC is very effective (cars, jumping visitors, "bombing", wind...) As the disturbance becomes "common" (earthquakes...), GIPC may play a negative role



Ex: in this case GIPC provided an anomalous correction to WE, twice larger than it had to be.



GIPC YES/NO: differental/common



COMMON

Voltage-rescaled differential LVDT motion: -copied by zM before the seism disturbance -amplified by the common, because zM=0 while $z^{Acc} \neq 0$



DIFFERENTIAL

Voltage-rescaled differential LVDT motion: -copied by zM -Compensates WI local motion, and the correction is significantly reduced

The solution: let GIPC use z_{IN}^{Acc} - z_{END}^{Acc}



GIPC YES/NO: differental/common: smart patches

- We investigated how to trigger the GIPC OFF/ON when needed:
- \bigstar definition of a practical index of coherent displacement.
- \bigstar definition of a function displaying the amplification due to GIPC (zM).
- \bigstar definition of reasonable veto to reduce false Earthquake alarms.
- \bigstar off-line matlab test using about 1 month data of VSR1.
- Alpization with SW and numerical consistency checks.
- In-line implementation with fake activation (AlpSa, Adj/Science)



EQG: examples of matlab simulations of VSR1 unlocks



Thresholds tuned: 25 s ave; Sci-Mode=>EQ-Mode;10 s ON/OFF operated ~ 100 s before

EQG: turning OFF false alarm



removing GIPC makes the lock more fragile in case of wind: a simple veto, the **wind speed** at the central Bld Station



thresholds calibrated in order not to switch OFF GIPC in case of wind

EQG: matlab test on VSR1 data



6/7 of the EQ occurred during VSR1 and causing unlocks were properly detected by EQG algorithm

EQ whose magnitude is M> ~6.5 would probably unlock the ITF anyway

EQ closer than 20-30 km have not the required coherent displacement: we had the chance to examine this very rare case (June 6th)

EQG: test in debug mode

Tested in debug-mode, running on line through a dummy ALP server; automated GIPC Switch-off works as the conditions are met (correlation index, zM index and wind veto)

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We have been lucky, an earthquake in Iran occurred on June 18th during the algorithm debug test: **Caught !**

EQG: only very close events (< 10-20 km) would cause "incoherent", "(O)) excitation and would not be detected by EQG.



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EQG: only very close events (< 10-20 km) would cause "incoherent"







μSFR

MicroSeism-free Reconstruction

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TH: suspensions in the central BLD are coherently excited by microseism (0.1-0.5 Hz)

The method: reconstruction of BS and PR zLVDT upon the basis of NI and WI zLvdt



1) differential Lvdt µseism-free available for BS and PR
 2) higher crossover frequency allowed!

Today's test !



Using analogic (DAC/ADC) connection between DSPs: tested PR-NI



Conclusions (EQG, i.e. GIPG OFF in case of earthquake)



- It has been tested and Alpized. Implementation is transparent
- A return algorithm has also been successfully tested as well.

Open issue:

- => Should the ITF be really set OUT of Science-mode during ON/OFF/ON ? In principle just two possibilities:
- success (the ITF does not unlock);
- unsuccess (the ITF unlocks because the EQ is too close or too intense).

Note:

- the switch variable is available in the data so no information is lost;
- automated ON/OFF/ON will allow to enhance the duty cycle;
- other actions are currently actuated by Alp during operation.

next mantenance break for the final implementation?

Conclusions (µSFR)



microseism-free position sensors are available using NI,WI LVDT basis.
the reconstruction was tested on data showing a remarkable suppression gain (at least 5, in case of intense sea activity much higher)

- In-line tests, using DAC/ADC cabling, being done
- Straightforward from the point of view of dsp cards.
- The final implementation (in case of successful in-line test) will be optimized by using serial links and SW updates for the DSP

next mantenance break for the final implementation?