

# Comparison among responses from L'Aquila (Italy) and Tohoku (Japan) Earthquakes

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## **L'Aquila Earthquake (Italy)**

06 April 2009

M 5.8

AQV – WE

PGA  $646.1 \text{ cm/s}^2 = 0.659 \text{ g}$

## **Tohoku Earthquake (Japan)**

11 March 2011

M 9.0

MYG004 – NS

PGA  $2647.8 \text{ cm/s}^2 = 2.699 \text{ g}$

**INPUT**  $h(t) = \frac{1}{m \omega_d} e^{-\zeta \omega_l t} \sin(\omega_d t), \quad \omega_d = \omega_l \sqrt{1 - \zeta^2}$  **OUTPUT**

$$u(t) = \int_{-\infty}^{+\infty} h(t - \tau) f(\tau) d\tau$$

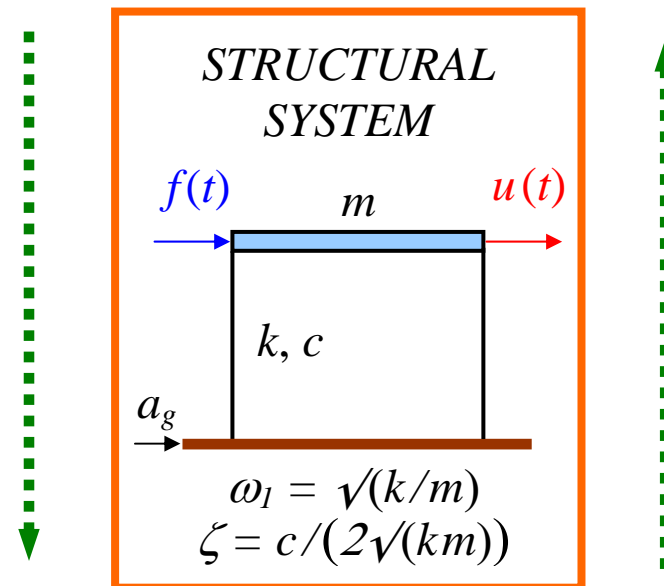
$$f(t) = -m a_g(t)$$

$$u(t)$$

**TIME  
DOMAIN**

$$F(\omega) = \int_{-\infty}^{+\infty} f(t) e^{-i\omega t} dt$$

$$u(t) = \frac{1}{2\pi} \int_{-\infty}^{+\infty} U(\omega) e^{i\omega t} d\omega$$



$$F(\omega) = -m A_g(\omega)$$

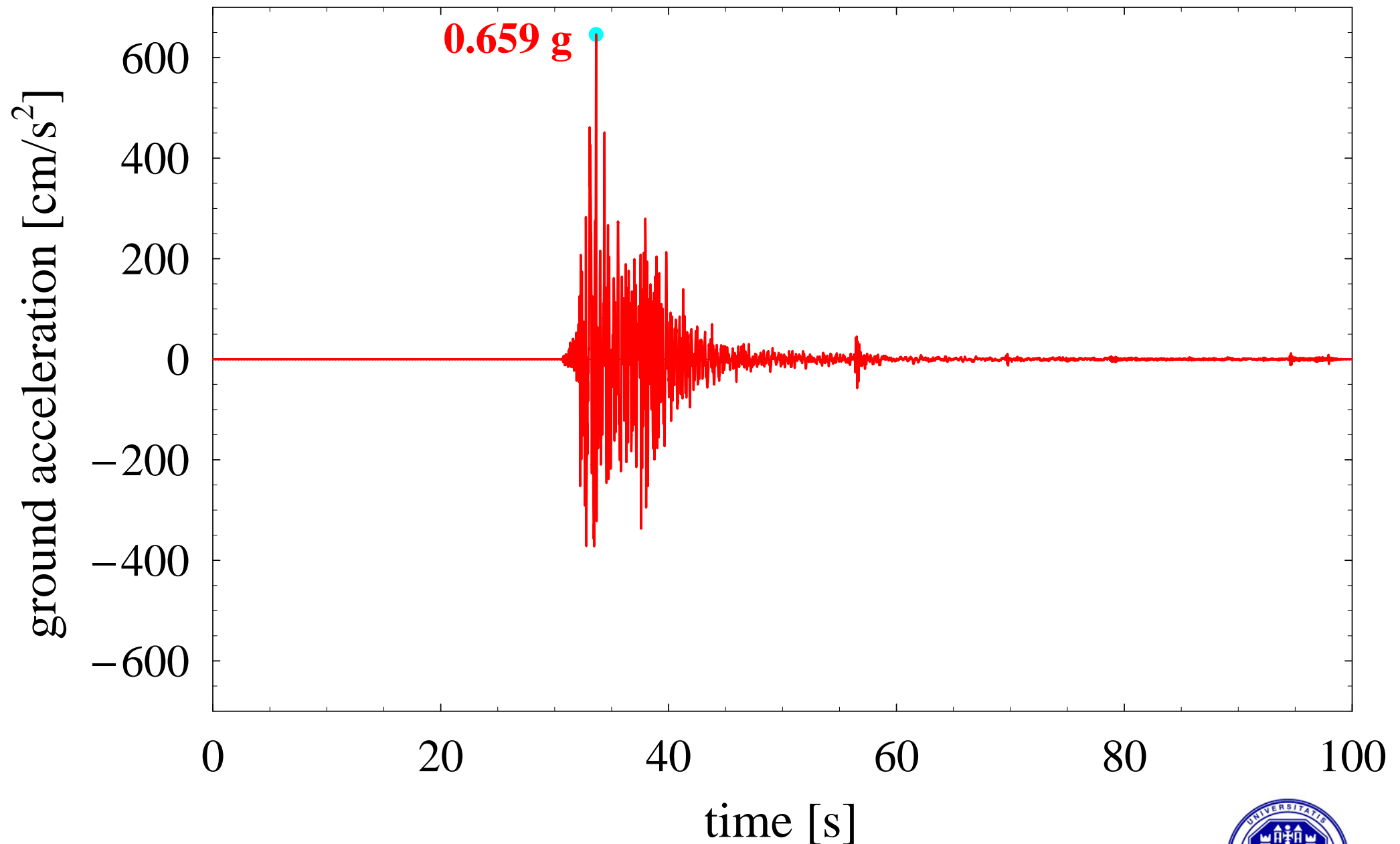
$$U(\omega)$$

**FREQUENCY  
DOMAIN**

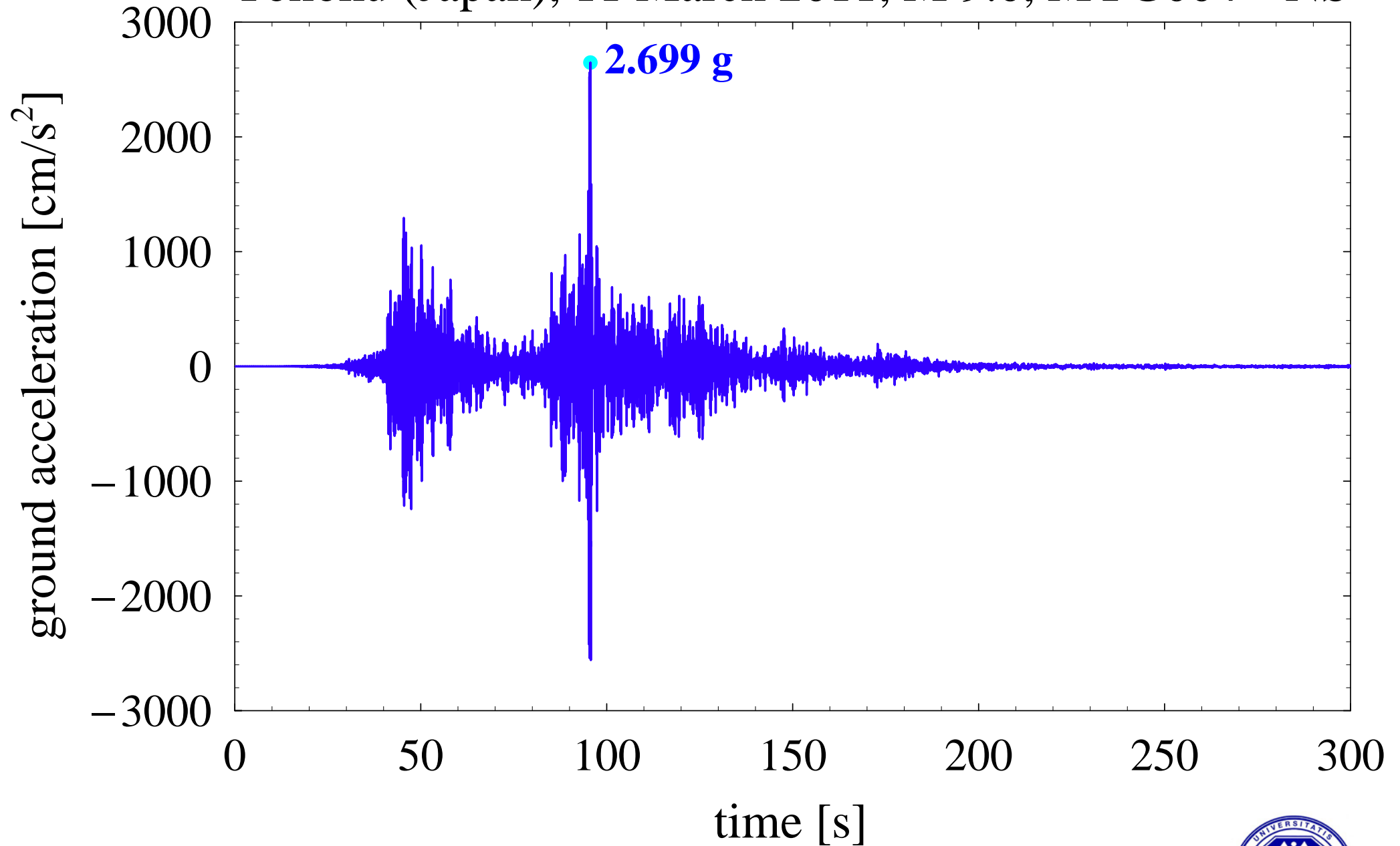
$$U(\omega) = H(\omega) F(\omega)$$

$$H(\omega) = (k - \omega^2 m + i \omega c)^{-1} = m^{-1} (\omega_l^2 - \omega^2 + i 2 \zeta \omega_l \omega)^{-1}$$

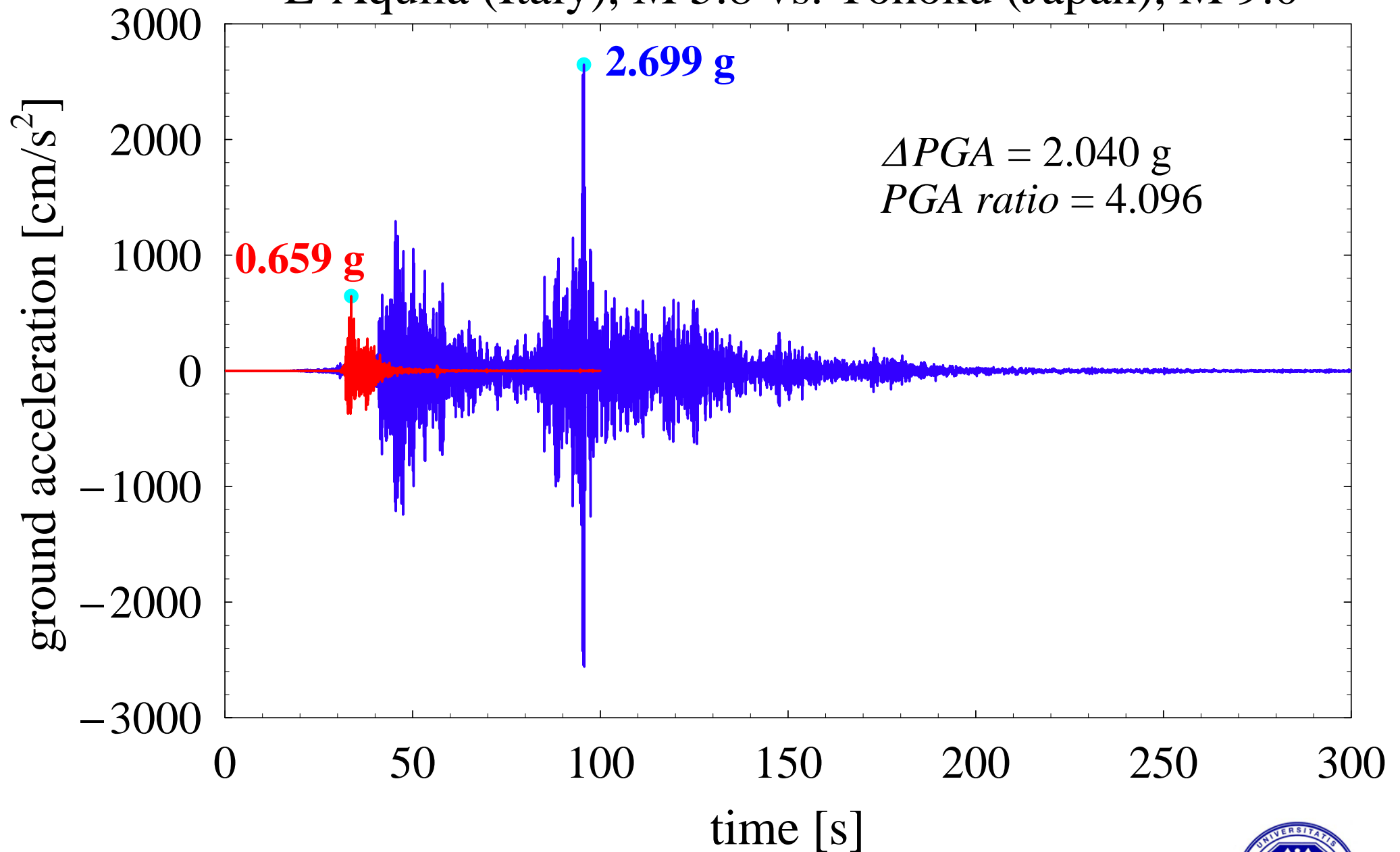
# L'Aquila (Italy), 06 April 2009, M 5.8, AQV – WE



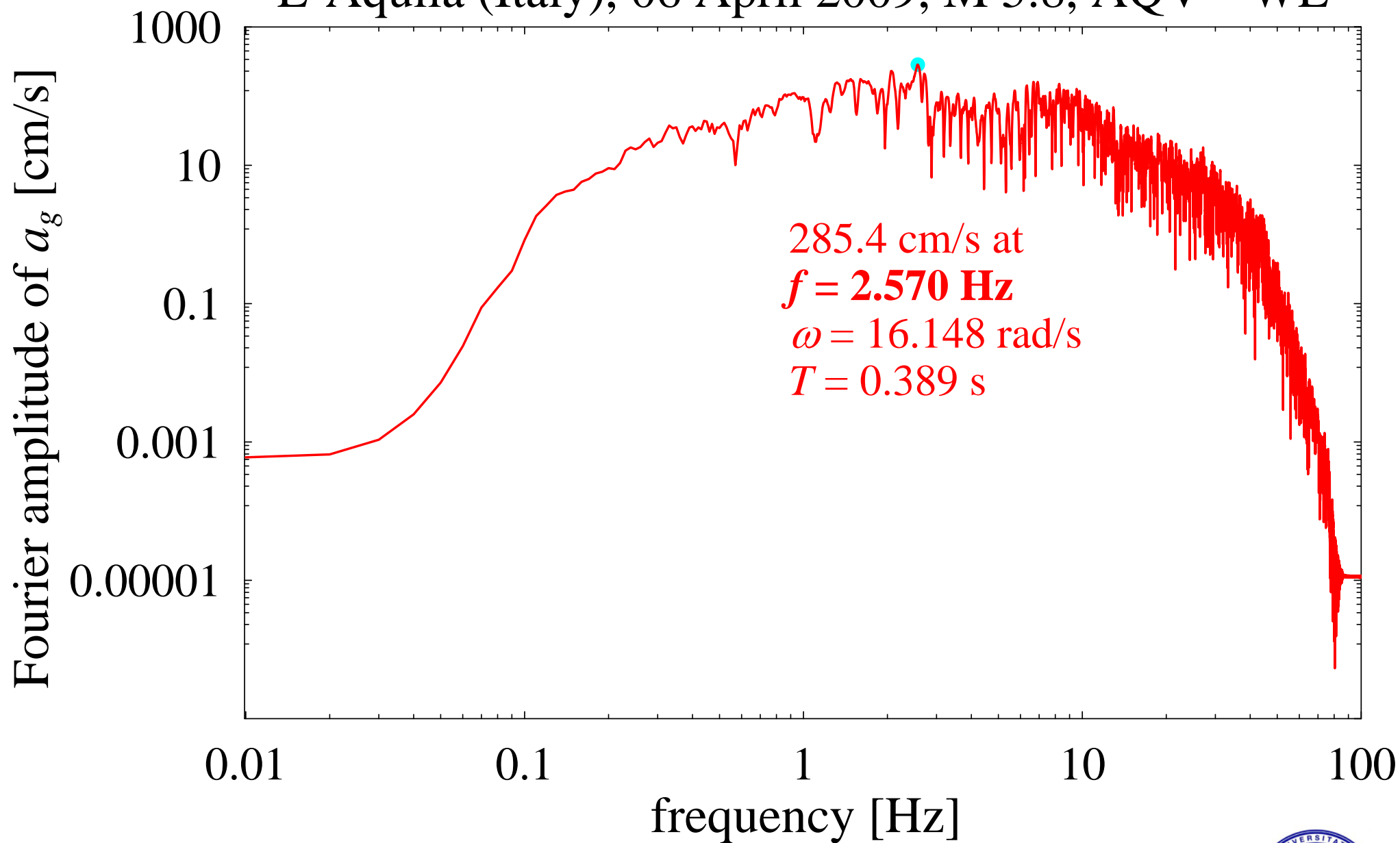
# Tohoku (Japan), 11 March 2011, M 9.0, MYG004 – NS



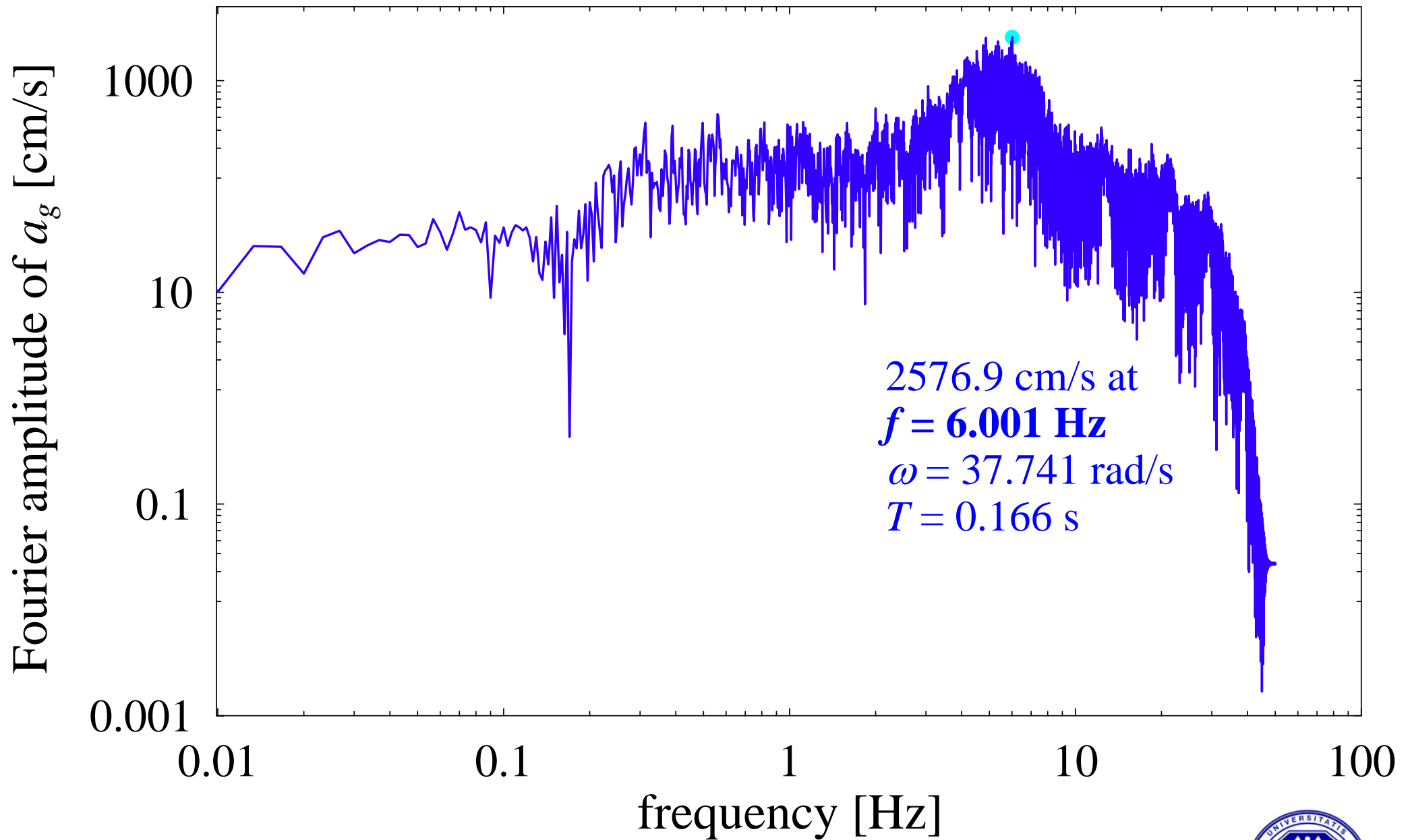
# L'Aquila (Italy), M 5.8 vs. Tohoku (Japan), M 9.0



# L'Aquila (Italy), 06 April 2009, M 5.8, AQV – WE

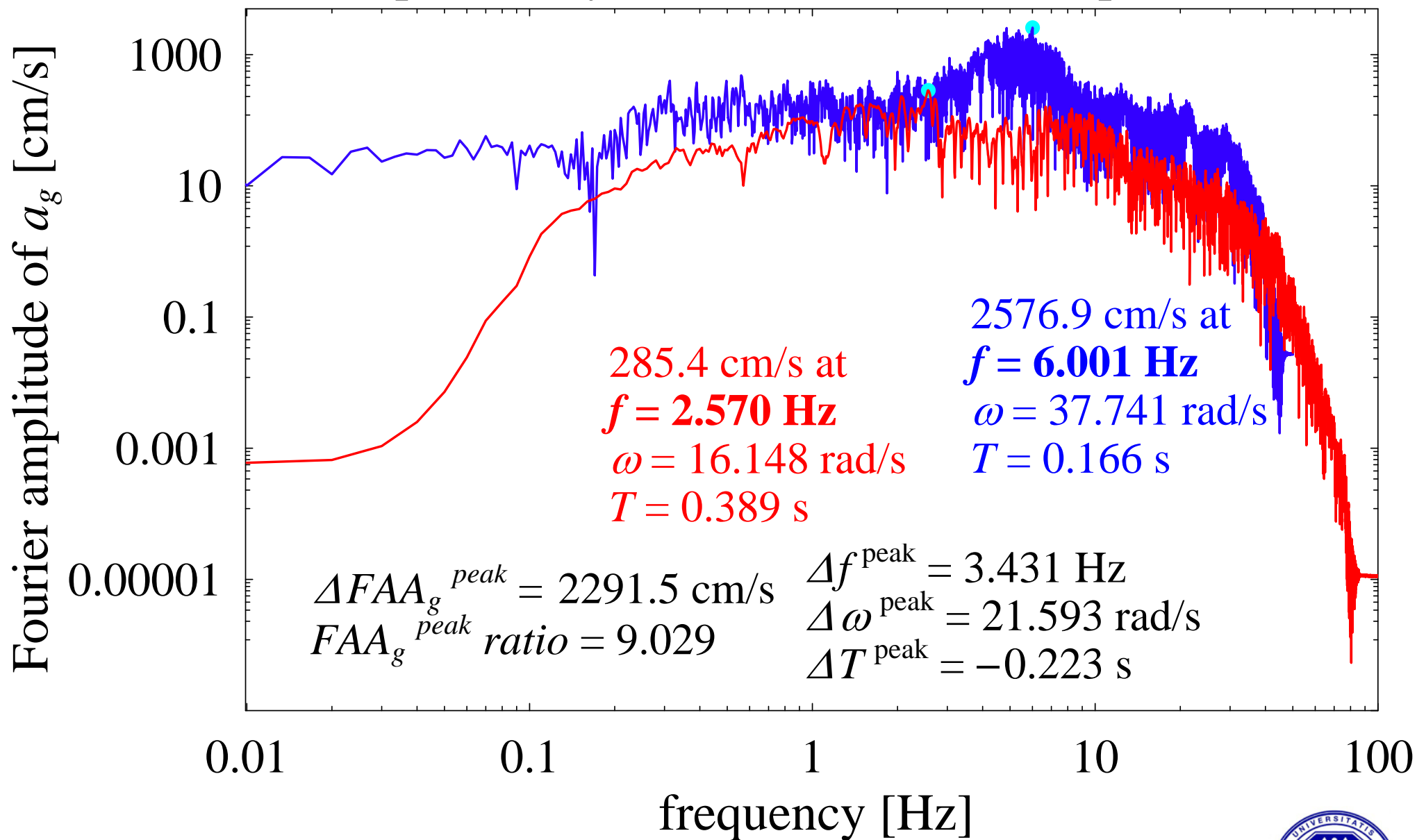


Tohoku (Japan), 11 March 2011, M 9.0, MYG004 – NS

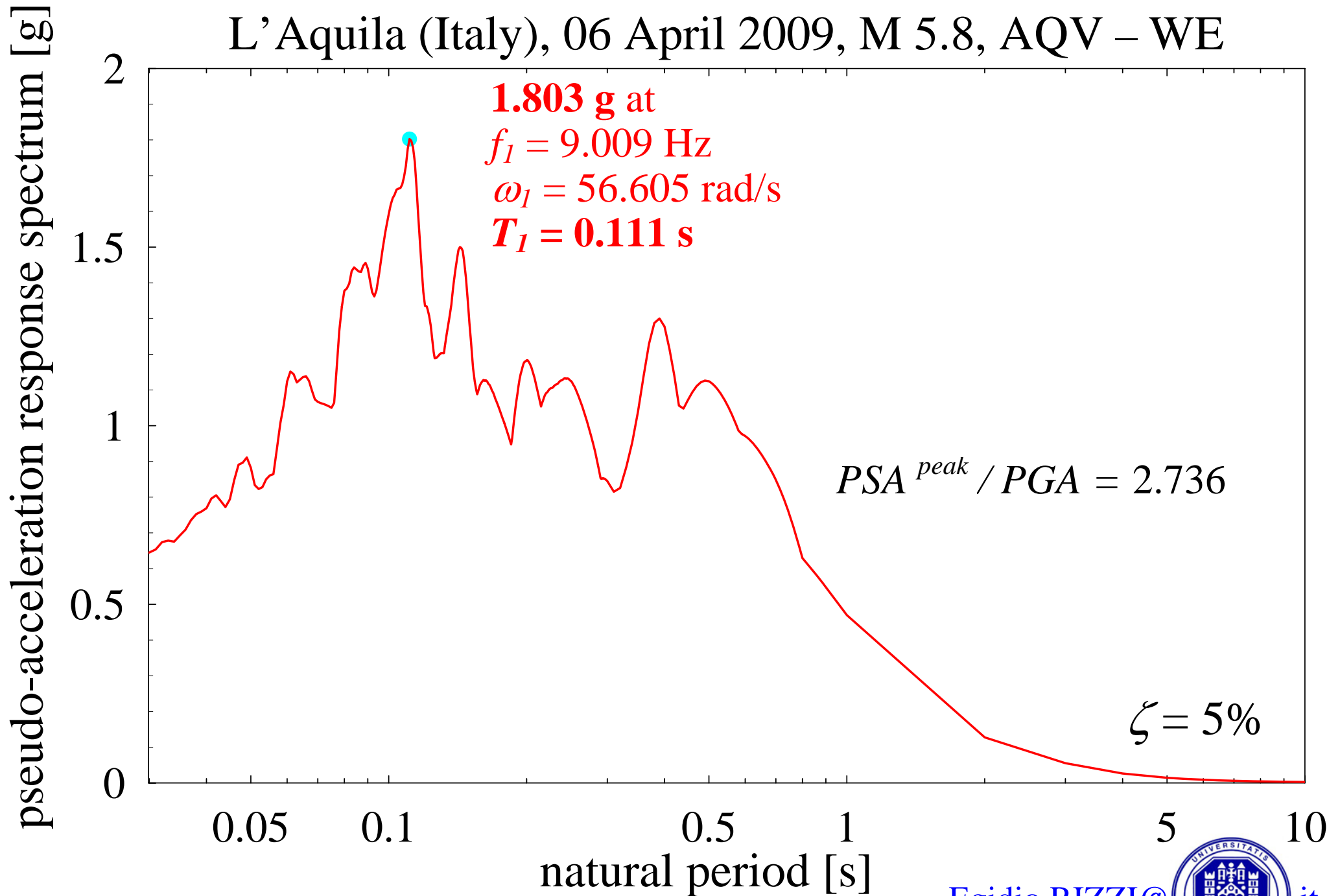




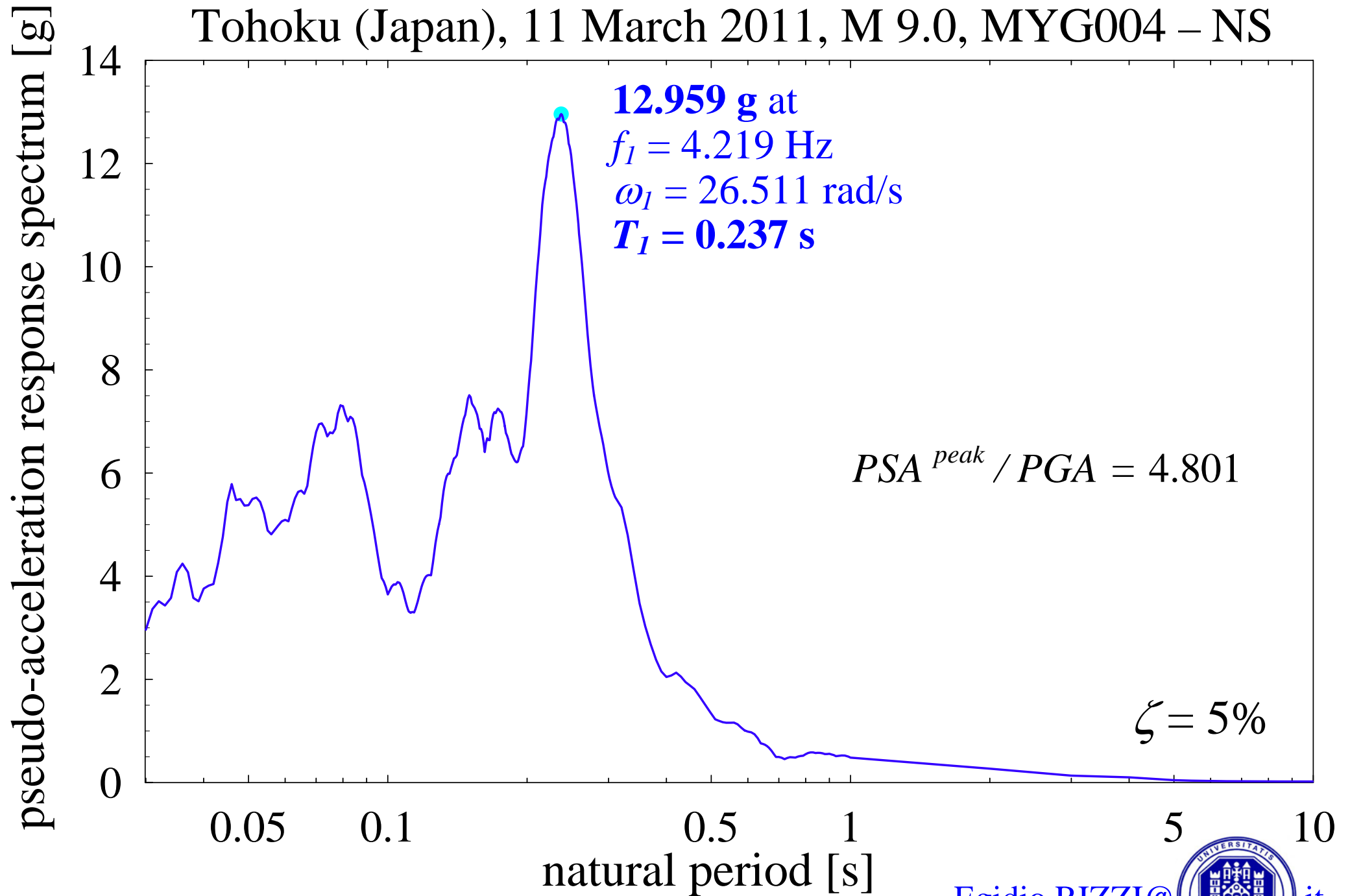
# L'Aquila (Italy), M 5.8 vs. Tohoku (Japan), M 9.0



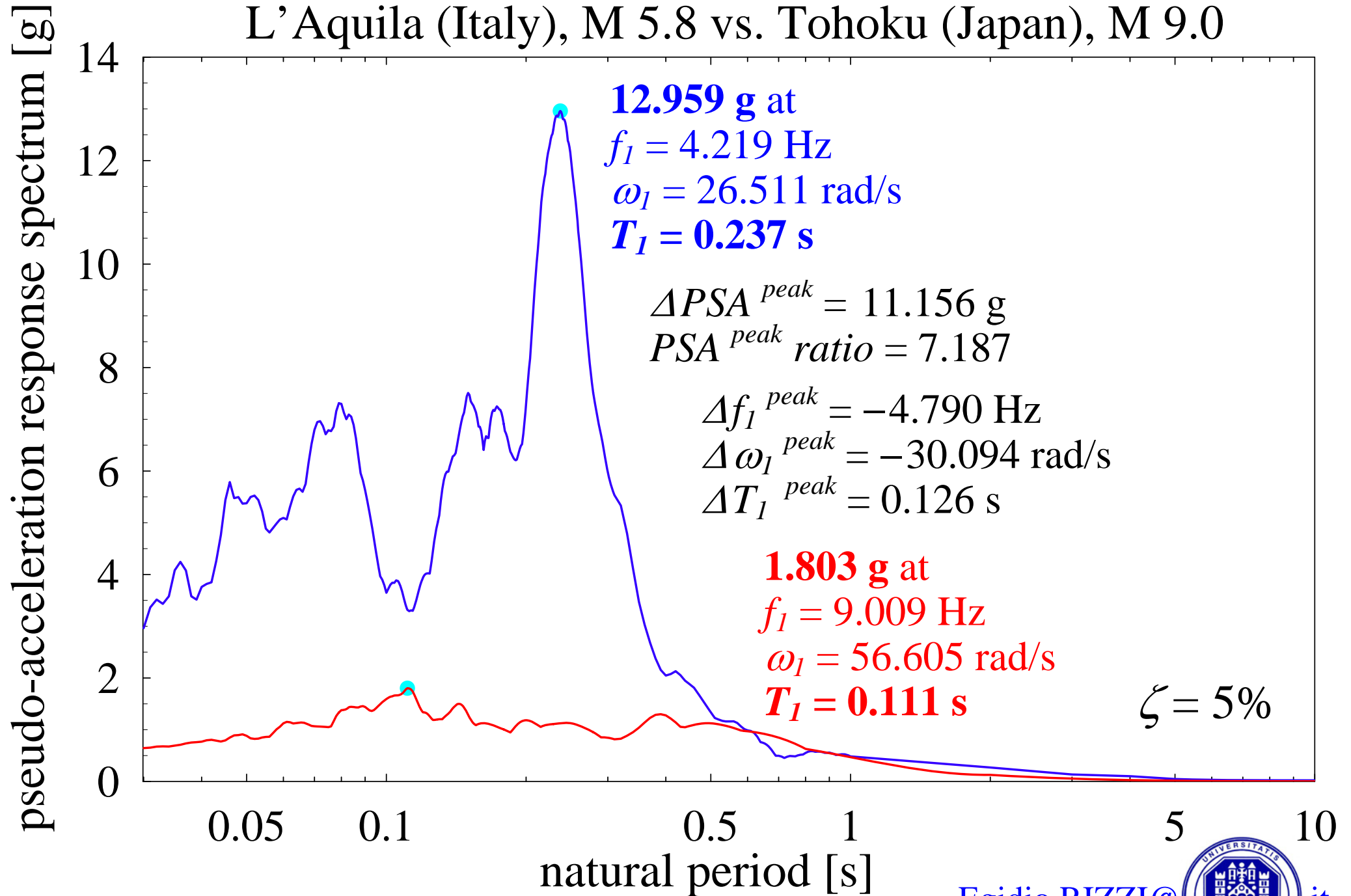
L'Aquila (Italy), 06 April 2009, M 5.8, AQV – WE



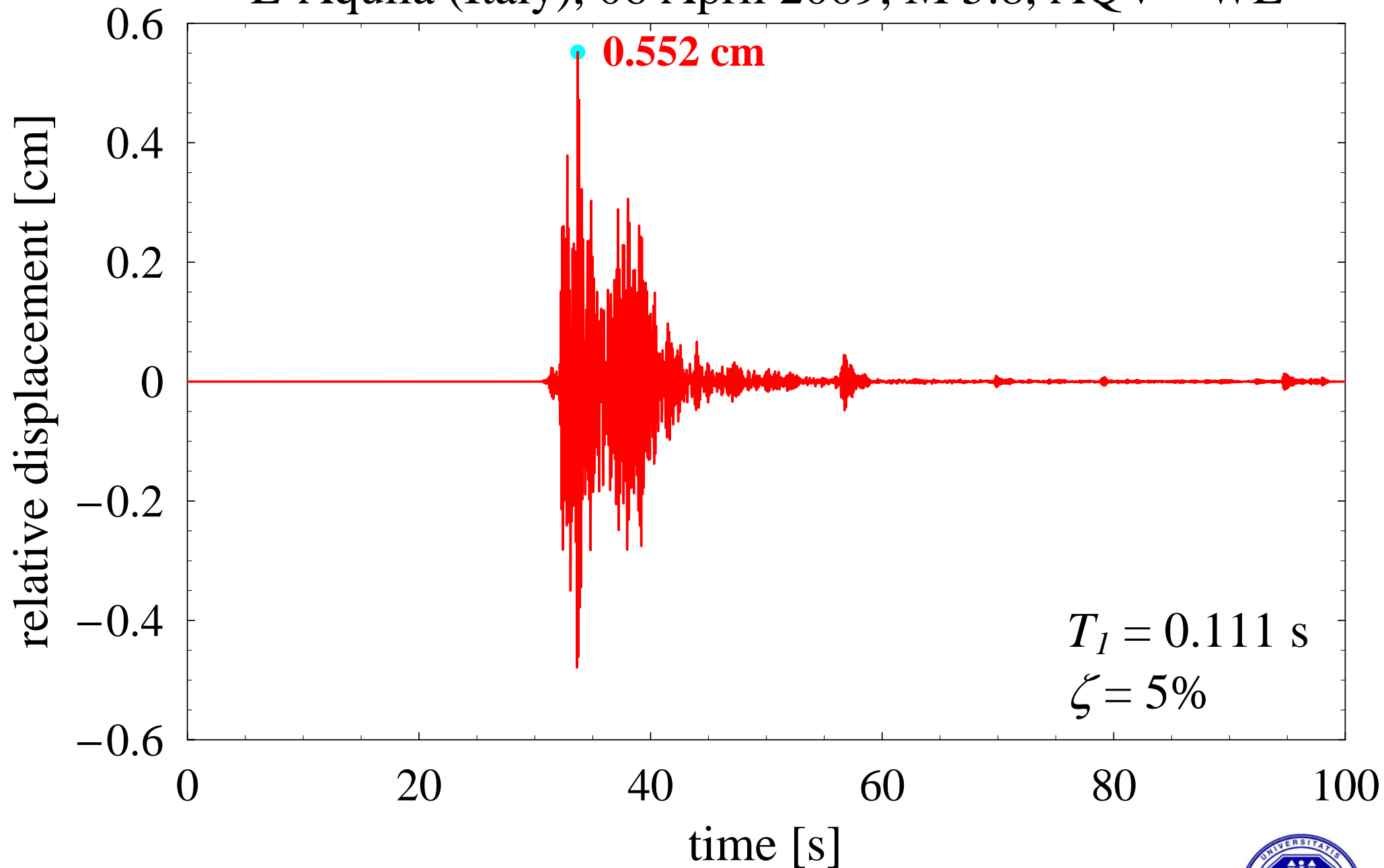
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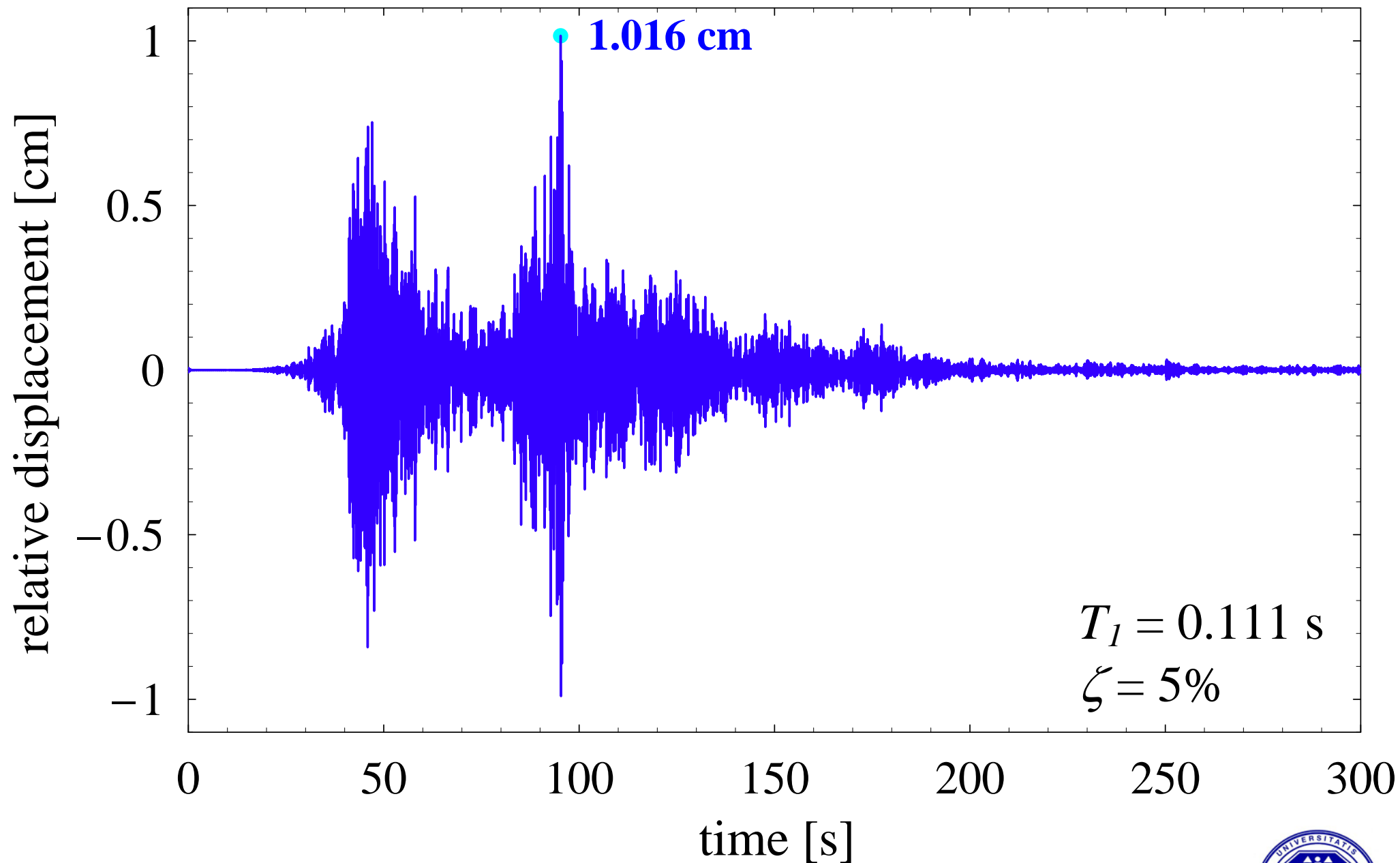
# L'Aquila (Italy), M 5.8 vs. Tohoku (Japan), M 9.0



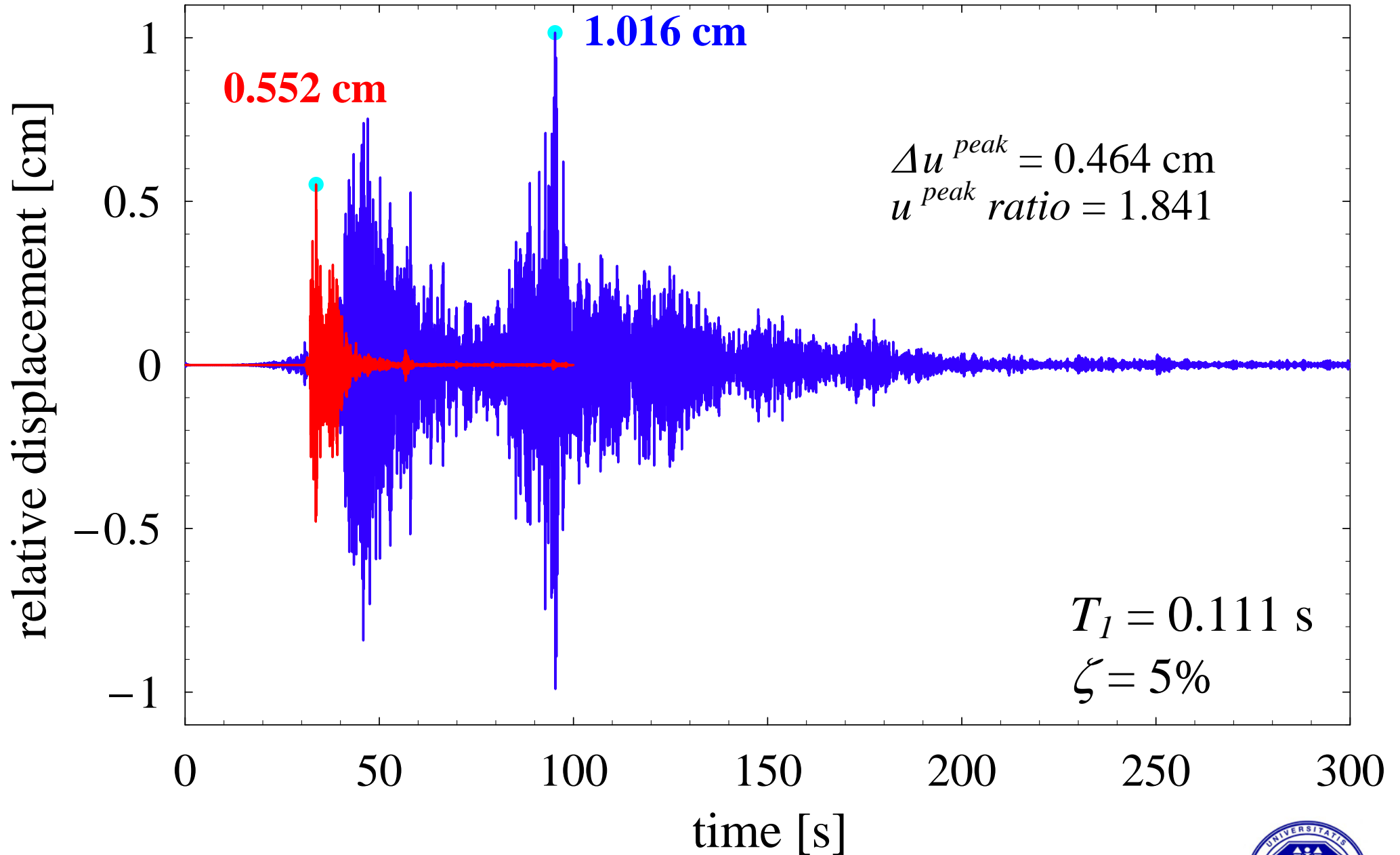
# L'Aquila (Italy), 06 April 2009, M 5.8, AQV – WE



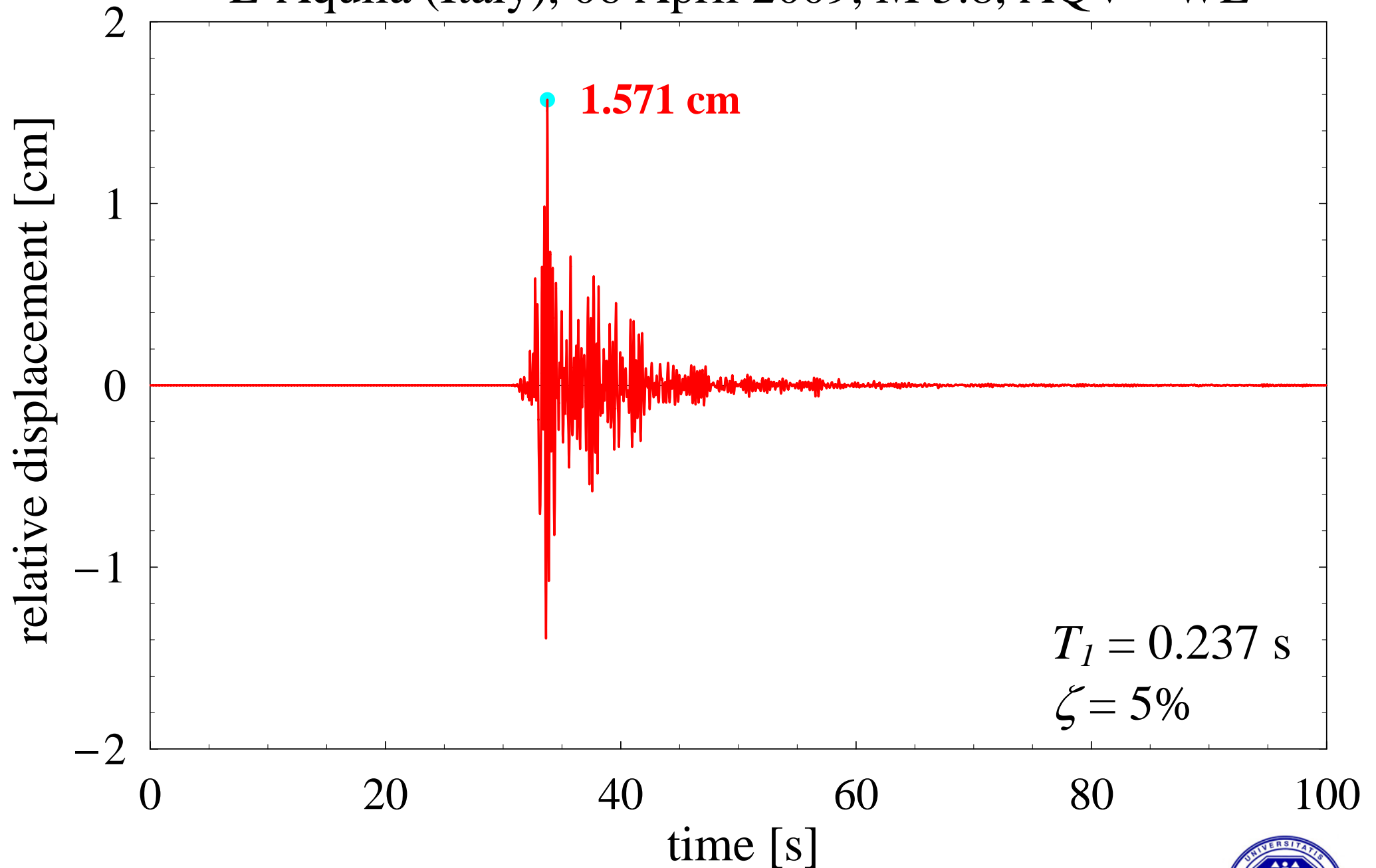
# Tohoku (Japan), 11 March 2011, M 9.0, MYG004 – NS



# L'Aquila (Italy), M 5.8 vs. Tohoku (Japan), M 9.0

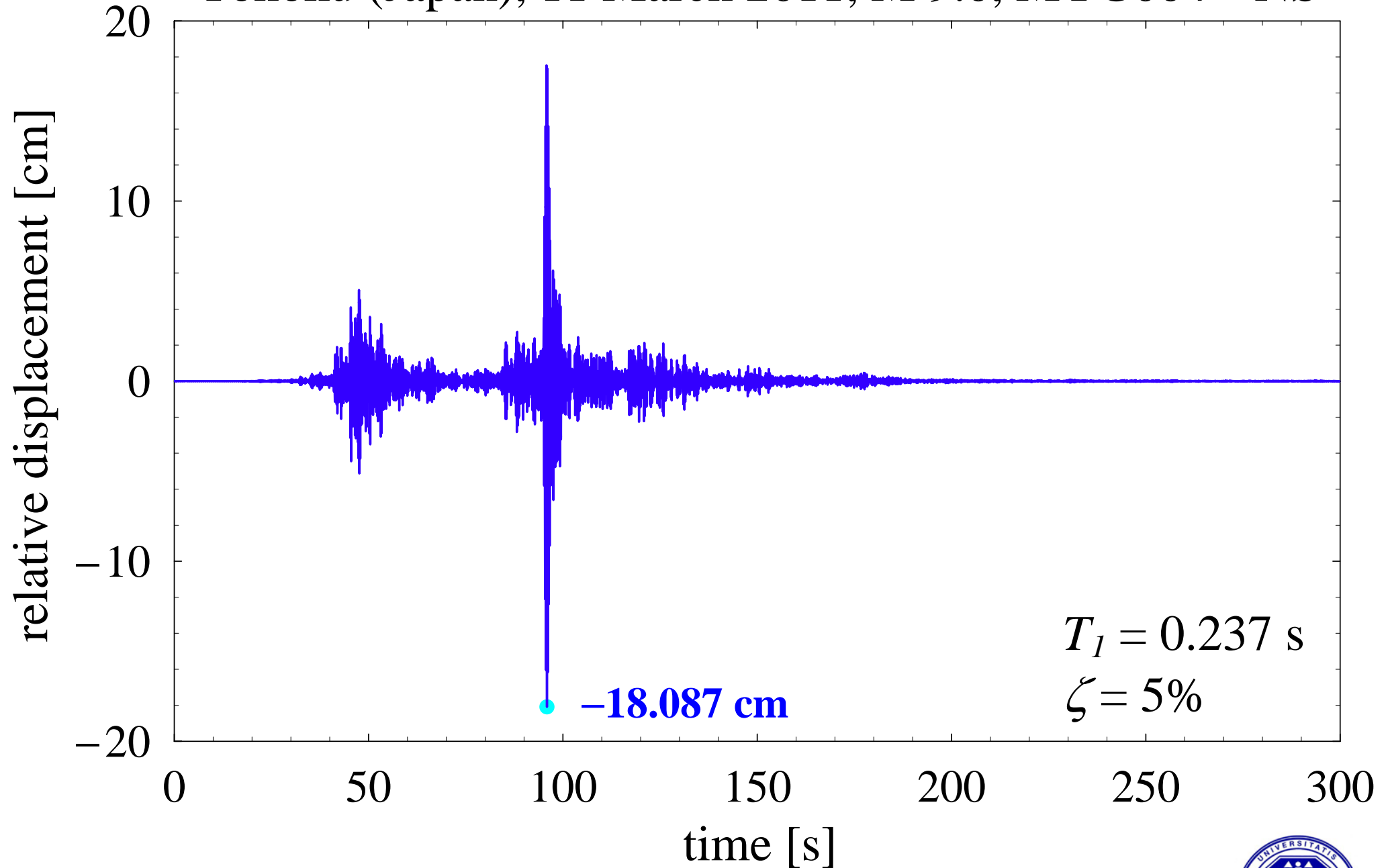


L'Aquila (Italy), 06 April 2009, M 5.8, AQV – WE





# Tohoku (Japan), 11 March 2011, M 9.0, MYG004 – NS



# L'Aquila (Italy), M 5.8 vs. Tohoku (Japan), M 9.0

