



Fig. 5 Displacement time history for vibration period $T=1.0$ s at ductility level $\mu = 6$

4. CONCLUSIONS

This paper investigated doublet earthquake events effects as a special ground motion excitation on linear and nonlinear response of SDOF systems. Three ductility level have considered in the analysis. Results highlighted the differences of real and artificial sequences features on response estimation. As a suggestion, artificial seismic sequences based on back-to-back method could be used with caution in the analysis procedure. It is found that second event may increase or decrease the residual displacement.

REFERENCES

- Ghods, A. Shabaniyan, E. Faridi, M. Bergman, E. Aziz-Zanjani, A. and Mortezaejad, G. (2015) "The Varzaghan-Ahar Earthquake Doublet (Mw 6.4, 6.2, Iran): Implication for the geodynamics of NW Iran", accepted for publication in *Geophysical Journal International*.
- Parisi, F., and Augenti, N. (2013) "Earthquake damages to cultural heritage constructions and simplified assessment of artworks", *Engineering Failure Analysis.*, **34**, 735–760.

- Penna, A., Morandi, P., Rota, M., Manzini, C.F., Porto, F., and Magenes, G. (2014), "Performance of masonry buildings during the Emilia 2012 earthquake", *Bull Earthquake Eng* 2014., **12**(5), 2255–2273.
- Yaghmaei-Sabegh, S. and Ghods, A. (2016), "A Comparative Study on Ground Motion Attenuation in the 2012 Varzaghan-Ahar Doublet event, Northwest of Iran", *Journal of Earthquake Engineering.*, **20**, 326–362.
- Yaghmaei-Sabegh, S., and Ruiz-García, J. (2016), "Nonlinear response analysis of SDOF systems subjected to doublet earthquake ground motions: A case study on 2012 Varzaghan-Ahar events", *Engineering Structures.*, **110**, 281–292.
- Zhai, CH., Wena, W-P., Chen, ZH., Lia, SH., and Xie, L-L. (2013), "Damage spectra for the mainshock-aftershock sequence-type ground motions". *Soil Dynamics and Earthquake Engineering.*, **45**,1–12.