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Modeling of episodic-transient signals in measurements of large ring lasers

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Large Ring Lasers (LRG) measure the Earth rotation rate and its variations with a precision as high as 10^{-8}. This has been demonstrated by direct observations of the diurnal polar motion and earthquake induced rotation fluctuations. Because of the substantial hardware improvement over the last two years the residual non-periodic signatures, which cannot be modeled by the known models for the Earth rotation fluctuations, can be found in the measured rotation rate of the ring laser G. A certain correlation with the atmospheric pressure changes and the wind field distribution suggests that regional effects like strain and wind loads might be causing such episodic-transient signals in the measurements of the RLG. To investigate the influence of atmospheric pressure loading (APL) and wind load on the signal of the RLG the finite element model representing the central Europe region surface has been created and evaluated with respect to the local rotation and orientation change. The effects of the APL and wind load were treated separately and the required data was obtained from the 3-D displacement field calculated by the model. The comparison of the modeling results with the data of RLG and other instruments located at the G ring laser site in Fundamentalstation Wettzell has been carried out.