G226-P007 **Room: Poster Session Hall** **Time: May 17**

Shape Fluctuations in formation process of a sandpile

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We use simulations to investigate the dynamics of the formation process of a sandpile. The top is a important factor to illustrate the shape of a sandpile. The direction of slopes are estimated by the relative position of the top and the edges of a sandpile. We make a sandpile on a circular table, and the edges position are fixed. We feed particles to the sandpile periodically to maintain the state that the sandpile is forming. Fed particles are dropped periodically from above the center of the table one by one, and T denotes its time interval.

We search the fluctuation of the top location of a sandpile. We found that the power spectrum of the time series of the top location obeys a

power law, and its exponent depend on T. In the case that T is small, the exponent is approximated to -1. On the other hand, the exponent become smaller with increasing T. The behavior of the exponent is the same in the cases of the two and three dimensional sandpiles.

In the case that the power spectrum is 1/f, avalanches occur continuously because T is small. The top location has a close relation to avalanches because the top is displaced in a direction opposite to avalanches by avalanches. In two dimensional sandpile, we measure avalanches using the kinetic energy. There are two slopes sectioned by the top, and avalanches occur in two direction approximately. Typically, avalanche takes place on one slope, and there are no avalanche on another slope. The slopes on which avalanches occur switches timewise. We introduce K(t) which is equal to +1 (-1) in the case that avalanche occur a slope (another slope) at time t. Thus, the time series of K(t) is a binarized time series. We found that the power spectrum of the time series of K(t) obeys the power function with the same exponent of that of the top location.

In three dimensional sandpile, avalanches take place on the triangular pyramid of the surface of a sandpile. We measure the horizontal component of the kinetic momentum of particles that represents avalanches. We define the angular component of the polar display of the kinetic momentum as the angle of avalanches. As in the case of a two dimensional sandpile, the power spectra of the top and the angle of avalanche are approximately the same.

From the results for the two and three dimensional sandples, the power spectrum 1/f is caused by the switching of the direction of avalanches. For the binarized time series, S. B. Lowen and M. C. Teich found analytically the relation between the exponents of the waiting time distribution of the time series and its power spectrum. The waiting time distribution of the time series of K(t) obeys a power law, and the relation between its exponent and the exponent of the power spectrum is consistent with the analytic theory.