Reduced Displacement

Assume cylindrical wavefronts (surface waves)
Let conduit radius increase from r_0 to $r_0 + u_{r_0}$
where $u_{r_0} \ll r_0$
This means the cross-sectional area of the conduit, A, has increased from

$$A = \pi r_0^2 \quad \text{to} \quad A + \Delta A = \pi(r_0 + u_{r_0})^2 \simeq \pi(r_0^2 + 2 r_0 u_{r_0})$$

Therefore

$$\boxed{\Delta A = 2\pi r_0 u_{r_0}}$$

Now assume the same volume is displaced at all distances from the source (as in the Mogi model – this is a near point source). Hence at a radial distance r_1 from the conduit, that point moves to $r_1 + u_{r_1}$, where u_{r_1} satisfies:

$$\pi(r_1 + u_{r_1})^2 = \pi r_1^2 + \Delta A$$

i.e. $$\boxed{u_{r_1} = \frac{\Delta A}{2\pi r_1}}$$ again for $u_{r_1} \ll r_1$

This is a decay law which holds for all points outside of the conduit (source region).

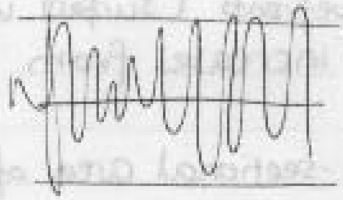
So in the definition of reduced displacement, $u_r r$ is just the area change of the conduit, divided by 2π. *

Is a near field law applicable? Need to know wave speed, station distances, source frequency etc.

Do ~~vent~~ conduit diameters correlate with tremor amplitude?

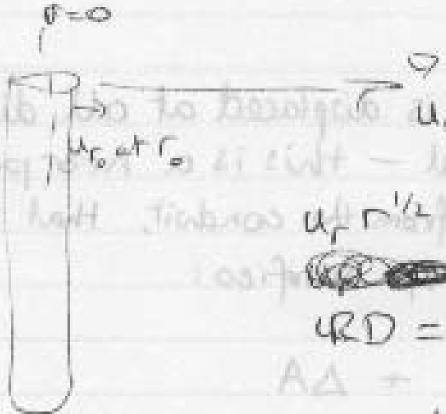
* The problem is, of course, complicated by many other effects.

$$\frac{u_r \sqrt{\lambda r}}{2\sqrt{2}}$$



$\therefore \frac{1}{2\sqrt{2}}$ reduced to rms

U_r



$$u_r r^{1/2} = \text{constant} = u_{r_0} r_0^{1/2}$$

$$URD = u_{r_0} r_0^{1/2}$$

$$u_r = \frac{A\sqrt{\lambda r}}{2\sqrt{2}M}$$