

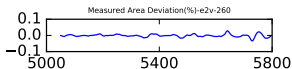
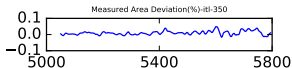
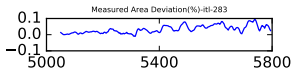
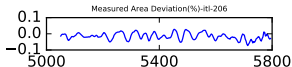
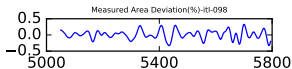
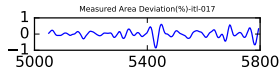
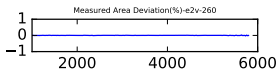
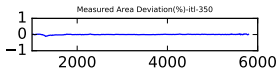
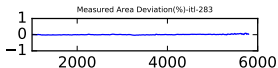
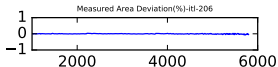
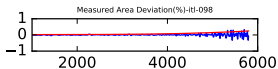
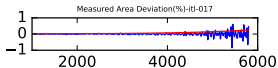
Tree Ring Model for DC2

Craig Lage

February 13, 2018

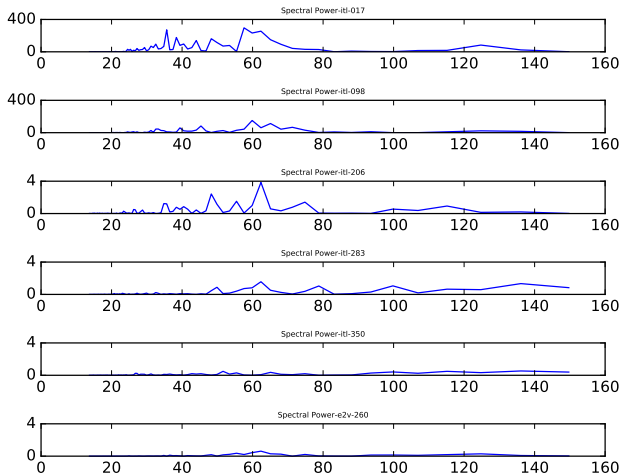
Acknowledgements:
HyeYun Park, Andrei Nomerotski

Tree Ring Data



- Data courtesy of HyeYun Park.
- Red curve in the first two is an $A + B * r^4$ fitting function.

Tree Ring Frequencies

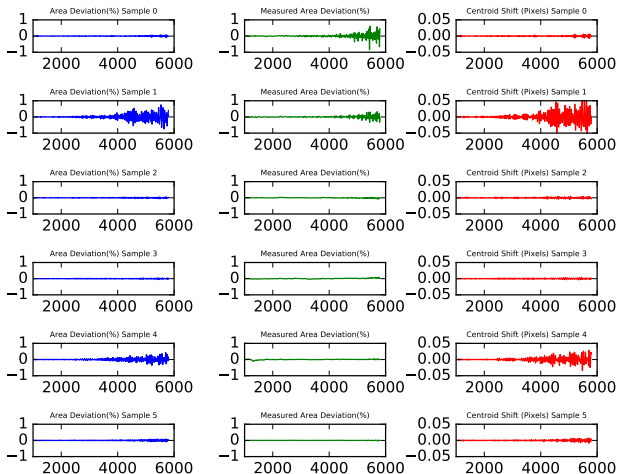


- Spatial frequencies show (approximately) one peak around 60 pixels, a smaller peak around 35 pixels.

Model Summary

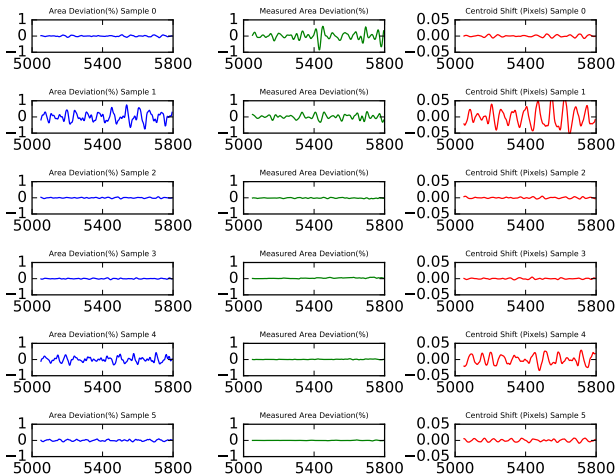
- We can't simply insert the measured data into GalSim, because we need to integrate the area deviation to get the pixel shift, which is what we need. It seemed easier to build a semi-empirical model which can be analytically integrated than try to numerically integrate the data
- Amplitude vs r scaled by $A + Br^4$.
- 40% of sensors have “large” tree rings, 60% have “small” (amplitude 10X smaller) tree rings.
- Based on the Fourier transform of the data, draw a range of frequencies (20 total). 75% have a spatial frequency drawn from a Gaussian with a mean of 60 pixels and a sigma of 10 pixels. 25% have a spatial frequency drawn from a Gaussian with a mean of 35 pixels and a sigma of 10 pixels.
- Each frequency is also given a random phase.

Tree Ring Model vs Data I



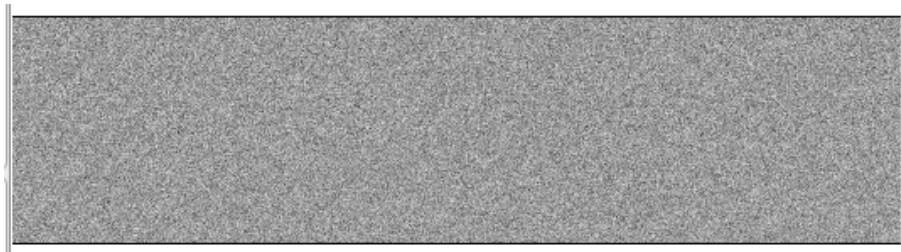
- Green curve (center) is the data. Blue curve (left) one instance of the model. Red curve(right) is the pixel shift, which is what will go into GalSim.
- Since the models are random draws, they will not match up to each data point, but seem to capture the general trends

Tree Ring Model vs Data II



- Green curve (center) is the data. Blue curve (left) one instance of the model. Red curve(right) is the pixel shift, which is what will go into GalSim.
- Since the models are random draws, they will not match up to each data point, but seem to capture the general trends.

DS9 Screen Shot - One amp, 1000 photons/pixel, Rotated 90 degrees



- Tree Rings are visible.