**Experiments/simulations to include:**

***Types of changes***

**(1)** **Stable land cover** - **(1a)** Undisturbed forests typically maintain relatively stable spectral signatures over many years (persisting forests) and **(1b)** non-forest land cover types (rangelands/shrubland and grassland) with spectral variability, both seasonally and inter-annually (persisting non-forests)

**(2)** **intra-annual change (seasonal)**, caused by vegetation phenology driven by seasonal patterns of environmental factors like temperature and precipitation

Characteristics: have marked impacts on spectral characteristics of the vegetation, tend to be especially pronounced in grasslands and deciduous forest

**(3)** **gradual inter-annual changes** are subtle “within-state” changes, caused by climate variability, or gradual change in land management or land degradation or forest fragmentation or natural succession, grazing pressure, and climate-induced “biome shifts” or damages due to fire, storm, floods, droughts, insects, or diseases. The recovery process of a forest stands from a non-stand replacement disturbance e.g., Forests or vegetation recovery, regrowth, and regeneration

Characteristics: relate to increases or decreases in the amount of greenness (or leaf area) detected by the EO sensors

**(4)** **abrupt change** caused by deforestation, clearing disturbance events, including harvest, urban development, agricultural expansion, etc. Non-stand clearing events such as thinning and selective logging

Characteristics: Radically alter the spectral properties of the land surface).

Requirements: developing consistent, efficient, and operational approaches to enable accurate characterization of these events

***Types of Data***

1. Use an NDVI index of minimum 0 and maximum 1
2. Long term time series of 50 years (Yearly)
3. Long term time series of 50 years (Monthly) (later)

***Types of Parameters***

1. No change occurrence (no change in land cover and no change in seasonality)
2. **Adding disturbances with a specific magnitude at different times**
3. Abrupt changes (5%, 10%, 20% and 50%, 60%, 100% change, termed negative 0.5, 0.4, 0.3, 0.2, 0.1,)
4. **Create a trend only component (negative or positive trend) with no other changes**
5. Gradual changes (5%, 10%, 20% and 50%, 60%, 70%, 100% of recovery, termed positive or negative trend 0.002, 0.0015, 0.001)
6. **Mixed abrupt and trend components (negative or positive trend)**
7. Different magnitudes of abrupt change (5%, 10%, 20% and 50%, 60%, 100% change) followed by different levels of trend (Recovery or regeneration) of (5%, 10%, 20% and 50%, 60%, 70%, 100% of recovery (different changes)
8. Adding abrupt changes (5%, 10%, 20% and 50%, 60%, 100% change) followed by fast recovery (once)
9. Adding abrupt changes (5%, 10%, 20% and 50%, 60%, 100% change) followed by steep positive trend (once)
10. Adding abrupt changes (5%, 10%, 20% and 50%, 60%, 100% change) followed by steep negative trend (once)
11. **Abrupt or trend components (negative or positive trend) with added noise and gaps**
12. adding noise values or signal contamination (e.g., atmospheric effect) and sensor effects in the time series to create realistic variations of (5%, 10%, 20%, and 50%) based on different standard deviations to see if algorithms can still pick up changes
13. Missing data/data Gaps /cloud shadows/snow pixel removal leading to gaps in time series (data removed from each simulated time series to create gaps)
14. Incorporate information on measurement error?????
15. **Test for autocorrelation**
16. Test for temporal/spatial autocorrelation in the data
17. **Adding seasonal changes**
18. Adding varying seasonality/ seasonal amplitudes, e.g. a change in LOS (length of season) or SOS (Start of Season) or number of seasons (later)

***RESULTS (their ability to detect)***

1. Abrupt changes
2. Gradual changes
3. Abrupt mixed with gradual changes
4. FALSE or TRUE or Missed changes
5. Change detection by noise level
6. Change detection by missing data / gaps
7. Seasonal changes