Description of Functions and System parameters

# System Specification:

1. Reduced dimension = 80 (can be changed upto 810)
2. Number of sources = 10 (can be changed)
3. Number of receptors = currently 9 (can be changed)
4. Dt = 1

# Description and Hierarchy of Functions:

1. **Gold standard.m**
   1. **Create\_sys\_atmosphere\_gold.m**
      1. Args: reduced\_dim
      2. Return: system matrices and initial condition A: 80x80, B:80x10,C:9x80,x0:80x1
      3. Description: Problem parameters are defined.
      4. # of sources (receptors) and source (receptor) positions are defined.
      5. **Atmo3dlax2** 
         1. Args: parameters Returns: SR,S,SC ?? (atmosphere states)
         2. Description: atmospheric model.
         3. Finding SVD to find reduced-order atmosphere model. Find the right and left transformation matrices for moving from original state to reduced state and vice versa.
   2. **Problem\_def\_gold**
      1. Args: A,B,C,x0
      2. Return: nothing (updates global variable)
      3. Description: Definition of Flags and initialization of variance, Graph generation, initialization of all the variables.
   3. **Sim\_system\_gold**
      1. Args: None
      2. Returns: None
      3. Description: calls f\_sim and sim\_obs\_gold
      4. **F\_sim**
         1. Args: x\_current
         2. Return: x\_next
         3. Process model.
      5. **Sim\_obs\_gold**
         1. Args: None (gets from global variable)
         2. Returns: None (gets from global variable)
         3. Observation model. Stores variable for all methods (Hybrid, CI, gold).
   4. **Pred**
      1. Args: None (gets from global)
      2. Return: None
      3. Filter prediction step. Does the prediction for all the algorithms and stores in global variables.
      4. **F**
         1. Prediction step. Gets x,P and returns predicted x,P.
      5. **H\_calc\_ver2**
         1. Args: x\_pred\_cen
         2. Returns: h\_cen, H\_cen, idx\_vis\_cen
         3. Building H matrix.
         4. Observation vectors and observation matrices are found.
      6. **H\_calc\_gold**
         1. Finding h and H matrices for Hybrid and CI.
   5. **Consensus\_gold**
      1. Args and Returns: None
      2. Description: Update step for centralized.
      3. **Calculate\_aver\_info\_gold**
         1. Args: none
         2. Returns: av\_delta\_I, av\_delta\_i
         3. Information update step.
      4. **Consensus\_our\_method (in the same file)**
         1. **Calc\_ci\_weights\_ver3**
            1. Args: S1,local\_inf\_vec,method\_
            2. Return: weights\_ci,inf\_mat,inf\_vect
            3. Description: Calculates CI weights and does CI on information matrix and information vectors.
      5. **Consensus\_CI**
         1. **Calc\_ci\_weights\_ver3**
   6. **Calc\_super\_gold\_update**
      1. Args and Returns: None.
      2. Description: Full history filter.
      3. **Run\_full\_filter (in the same file)**
         1. Args: Agent id
         2. Return: none
         3. Full history filter.
   7. **post\_process \_gold2**
      1. Args: None
      2. Return: error\_results,opt\_dist\_result
      3. Calculates error metrics for all the algorithms.