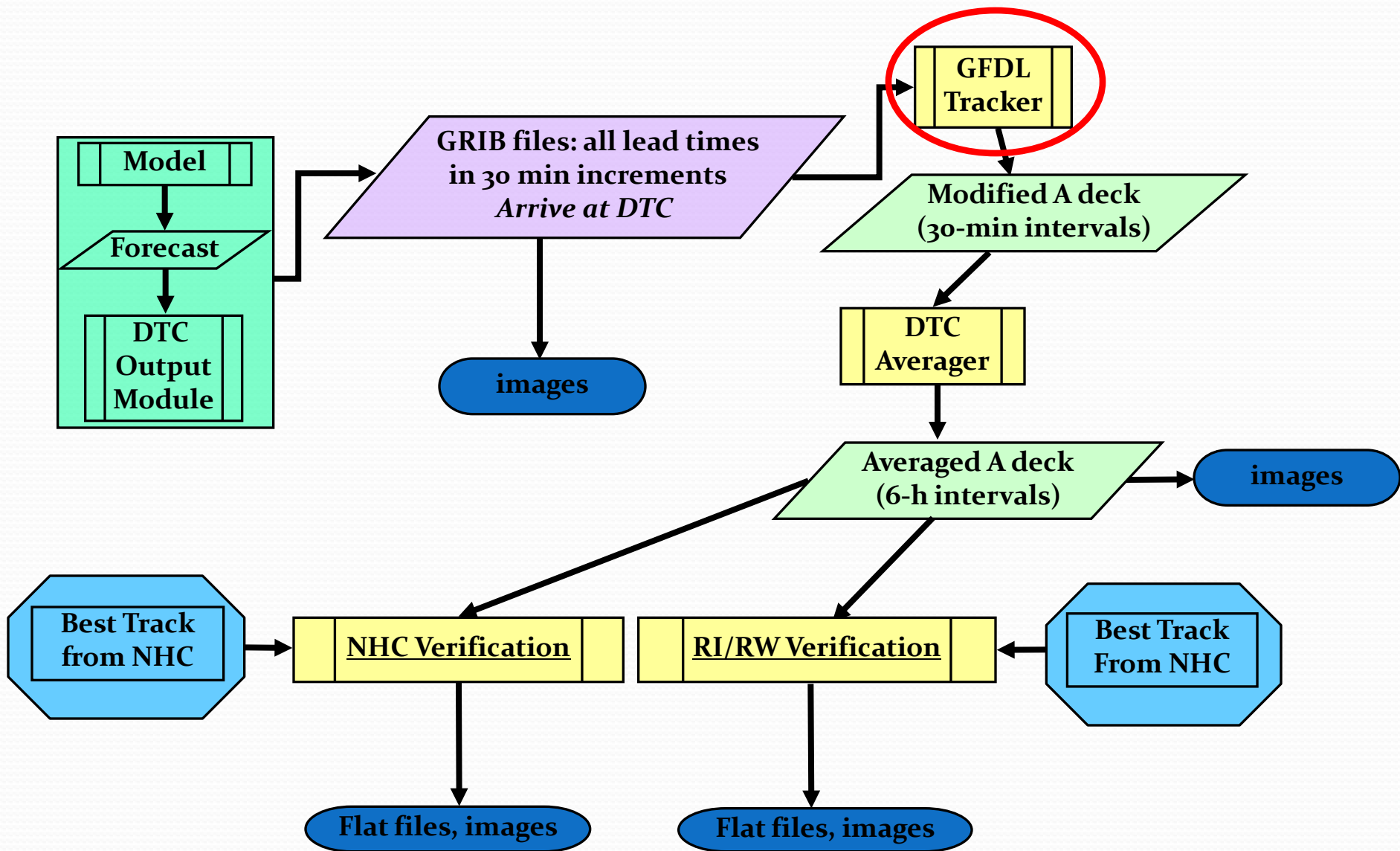


GFDL VORTEX TRACKER for HRH TEST

Developmental Testbed Center

MAY 07 2009

DTC Evaluation System for HRH



GFDL VORTEX TRACKER

INPUT DATA and first guess
(GRIB Format, LAT/LON Grid,
highest frequency: Hourly)

850 mb absolute vorticity
850 mb gp hgt
700 mb absolute vorticity
700 mb gp hgt
MSLP

850 mb WIND
700 mb WIND
near-surface WIND

BARNES
ANALYSIS
(for 5 primary
parameters)
4 loops

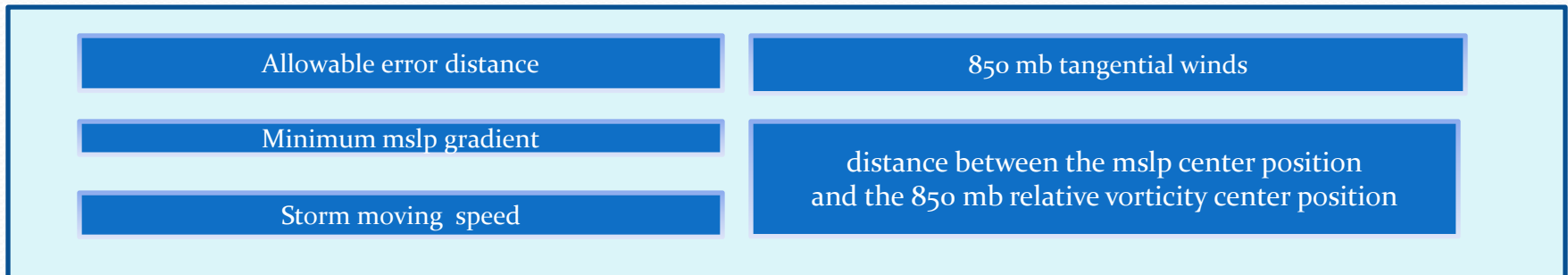
$$B_g = \frac{\sum_{n=1}^N w_n F(n)}{\sum_{n=1}^N w_n}$$

$$w = e^{-(d_n^2/r_e^2)}$$

BARNES ANALYSIS
For 850/700 mb/near sfc WINDS
On Smaller Grid

Average fixes from the parameters to
get the best fix position

For high resolution, some points are skipped
to speed up the Barnes analysis



ATCF-UNIX format output: hourly output

Ability to read in forecast lead time in minutes and movable grid

INPUT DATA and first guess
(GRIB Format, movable LAT/LON Grid,
highest frequency: minute, interval can be irregular)

850 mb absolute vorticity
850 mb gp hgt
700 mb absolute vorticity
700 mb gp hgt
MSLP

850 mb WIND
700 mb WIND

near-surface WIND

BARNES
ANALYSIS
(for 5 primary
parameters)
4 loops

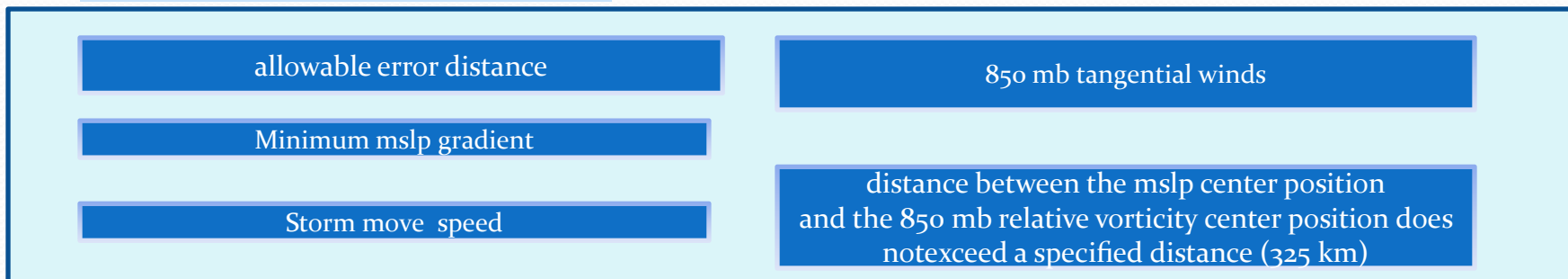
$$B_g = \frac{\sum_{n=1}^N w_n F(n)}{\sum_{n=1}^N w_n}$$

$$w = e^{-(d_n^2/r_e^2)}$$

BARNES ANALYSIS
For 850/700 mb/near sfc WINDS
On Smaller Grid

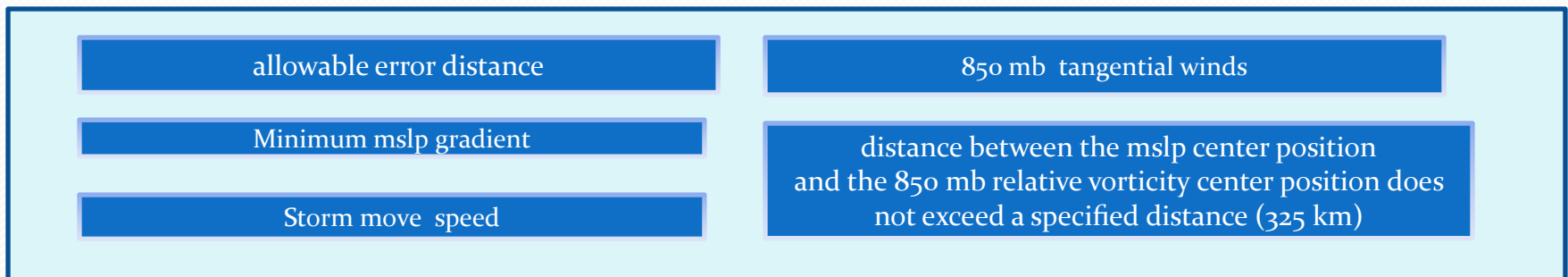
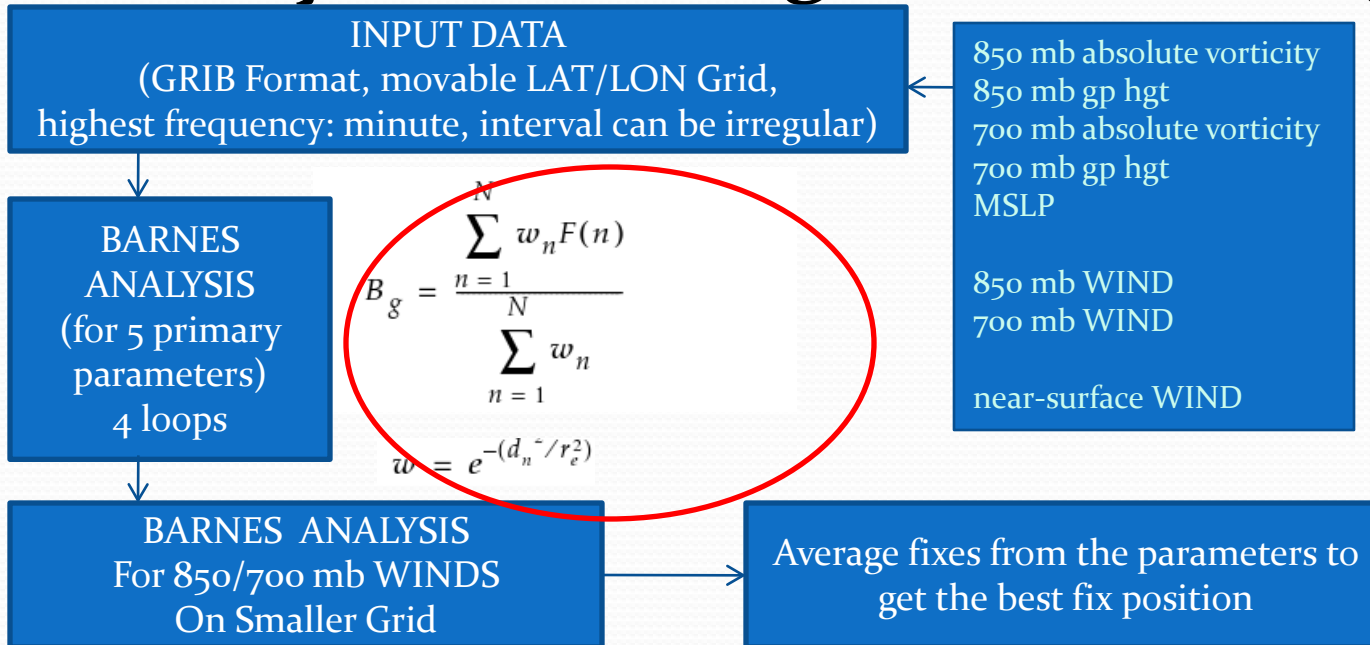
Average fixes from the parameters to
get the best fix position

For high resolution, some points are skipped
to speed up the Barnes analysis



ATCF-UNIX format output: allow sub-hourly output

Ability to track high-resolution grid



ATCF-UNIX format output: allow sub-hourly output

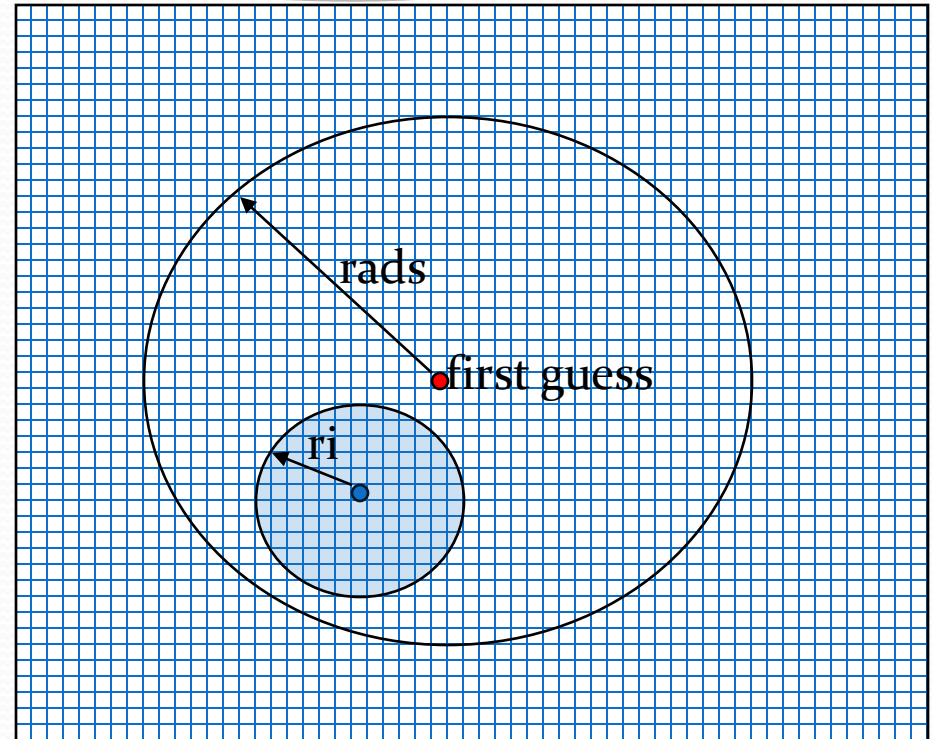
Barnes analysis parameters

grid space > 1.26 deg
 rads=350km
 re=150km
 ri=300km

grid space < 1.26 deg
 rads=300km
 re=75km
 ri=150km

0.1 deg < grid space < 0.4 deg
 rads=200km
 re=75km
 ri=150km

grid space < 0.1 deg
 rads=150km
 re=60km
 ri=150km



$$B_g = \frac{\sum_{n=1}^N w_n F(n)}{\sum_{n=1}^N w_n}$$

$$w = e^{-(d_n^2 / r_e^2)}$$

re

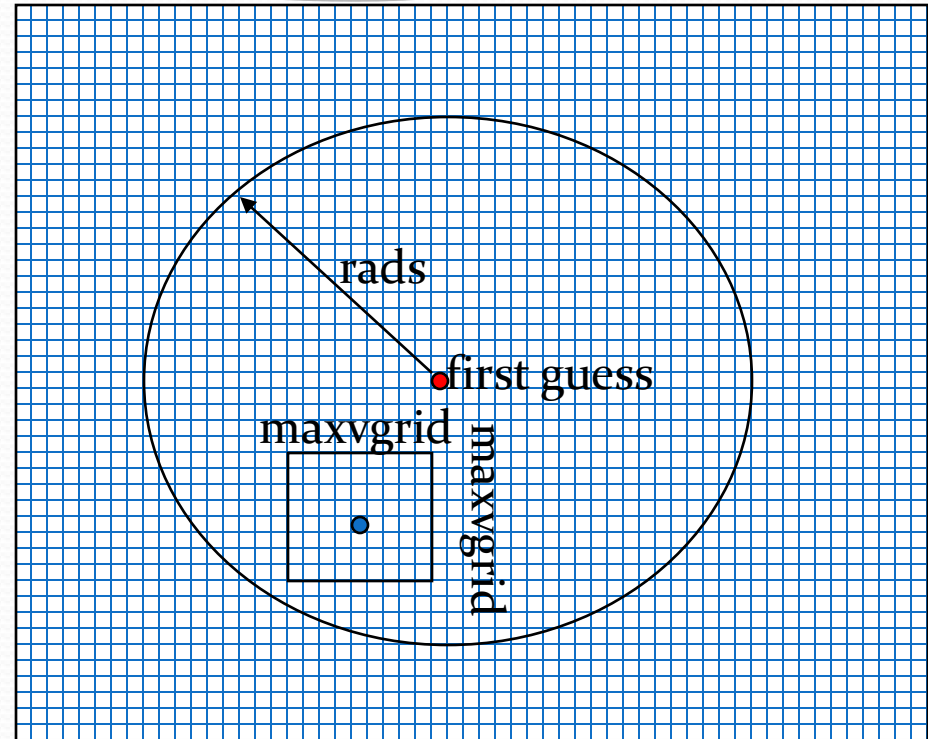
rads --maximum radius for searching for the storm center
 re----- e-folding radius (for Barnes smoothing)
 ri----- influence radius (for Barnes smoothing)

Barnes analysis parameters for WINDS

rads=120km
 ri=120km
 re=f(maxvgrid)

gridsize > 0.04 deg
 maxvgrid=8

gridsize < 0.04 deg
 maxvgrid=12



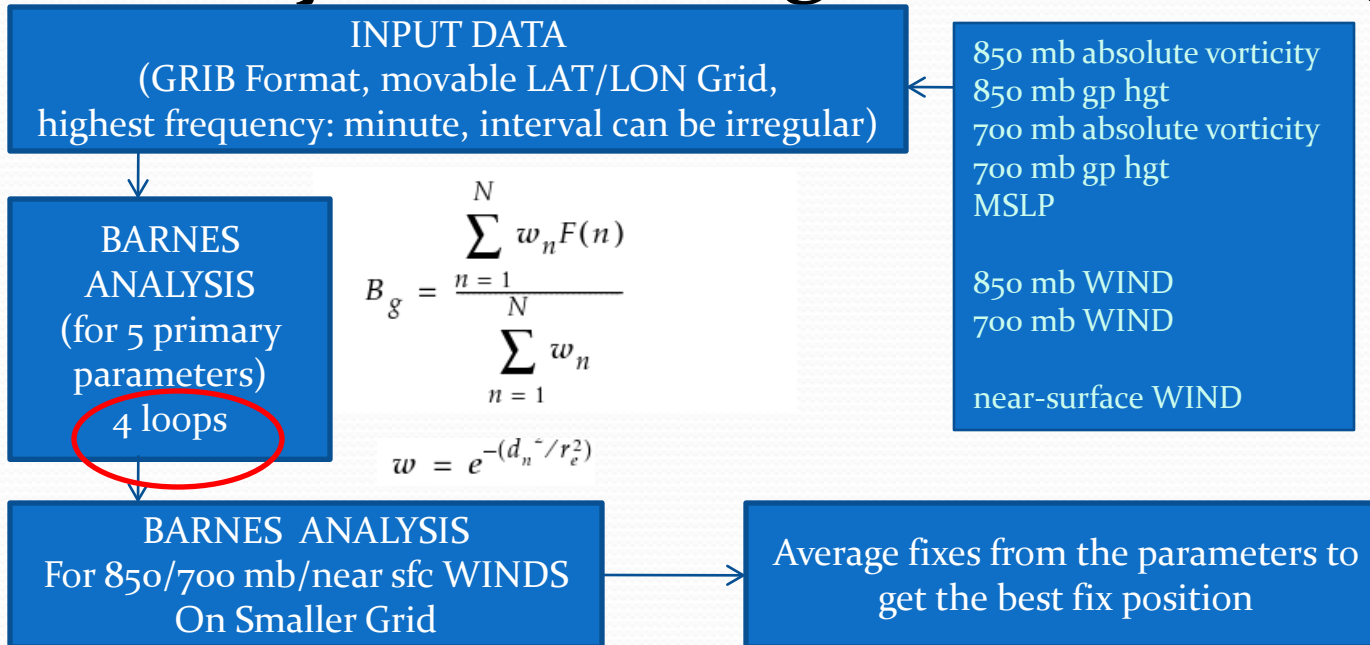
$$B_g = \frac{\sum_{n=1}^N w_n F(n)}{\sum_{n=1}^N w_n}$$

$$w = e^{-(d_n^2/r_e^2)}$$

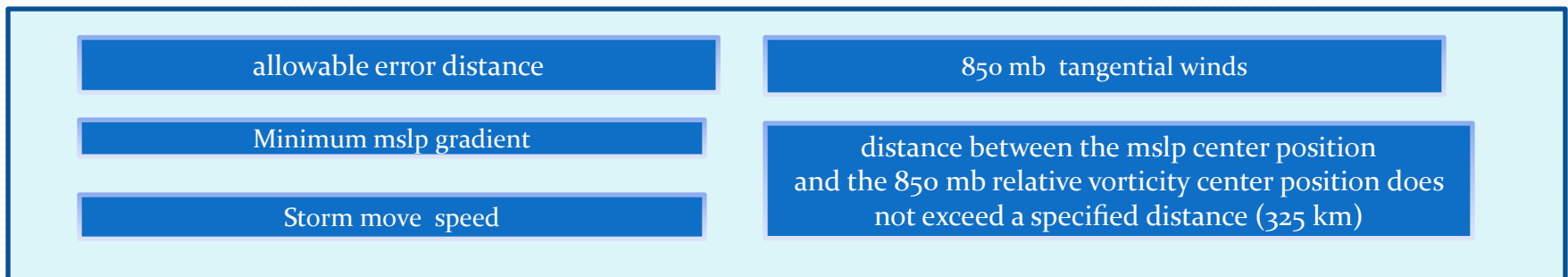
re

rads --maximum radius for searching for the storm center
 re----- e-folding radius (for Barnes smoothing)
 ri----- influence radius (for Barnes smoothing)

Ability to track high-resolution grid



For high resolution, some points are skipped
to speed up the Barnes analysis



ATCF-UNIX format output: allow sub-hourly output

Subsequent refined searches

gridsize > 1.2 deg

numinterp = 4

gridsize > 0.50 .and. gridsize <= 1.2 then

numinterp = 3

gridsize > 0.25 .and. gridsize <= 0.5 then

numinterp = 2

gridsize > 0.10 .and. gridsize <= 0.25 then

numinterp = 1

gridsize <= 0.10 then

numinterp = 0

numinterp: number of refined searches.

INPUT DATA and first guess
(GRIB Format, LAT/LON movable nest Grid,
highest frequency: minute, interval can be irregular)

850 mb absolute vorticity
850 mb gp hgt
700 mb absolute vorticity
700 mb gp hgt
MSLP

850 mb WIND
700 mb WIND

near-surface WIND

BARNES
ANALYSIS
(for 5 primary
parameters)
4 loops

$$B_g = \frac{\sum_{n=1}^N w_n F(n)}{\sum_{n=1}^N w_n}$$
$$w = e^{-(d_n^2/r_e^2)}$$

BARNES ANALYSIS
For 850/700 mb WINDS
On Smaller Fine Grid

Average fixes from the parameters to
get the best fix position

For high resolution, some points are skipped
to speed up the Barnes analysis

allowable error distance	For the 850 mb winds, tangential winds
Minimum mslp gradient	distance between the mslp center position and the 850 mb relative vorticity center position does not exceed a specified distance (325 km)
Storm moving speed	

ATCF-UNIX format output: allow sub-hourly output

gridsize > 0.20

bskip = 1

gridsize > 0.10 .and. gridsize <= 0.20 bskip = 2

gridsize > 0.05 .and. gridsize <= 0.10 bskip = 3

gridsize > 0.03 .and. gridsize <= 0.05 bskip = 5

gridsize <= 0.03

bskip = 10

INPUT DATA and first guess
(GRIB Format, LAT/LON Grid,
highest frequency: minute, interval can be irregular)

850 mb absolute vorticity
850 mb gp hgt
700 mb absolute vorticity
700 mb gp hgt
MSLP

850 mb WIND
700 mb WIND

near-surface WIND

BARNES
ANALYSIS
(for 5 primary
parameters)
4 loops

$$B_g = \frac{\sum_{n=1}^N w_n F(n)}{\sum_{n=1}^N w_n}$$

$$w = e^{-(d_n^2/r_e^2)}$$

BARNES ANALYSIS
For 850/700 mb/sfc WINDS
On Smaller Finer Grid

Average fixes from the parameters to
get the best fix position

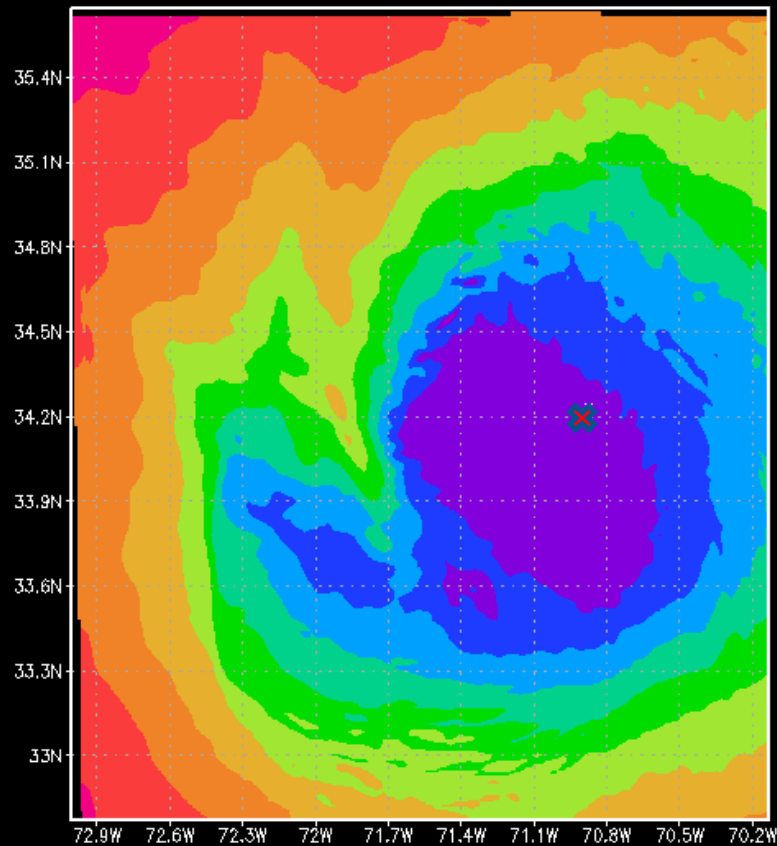
For high resolution, some points are skipped
to speed up the Barnes analysis

allowable error distance	For the 850 mb winds, tangential winds
Minimum mslp gradient	distance between the mslp center position and the 850 mb relative vorticity center position does not exceed a specified distance (325 km)
Storm moving speed	

ATCF-UNIX format output: allow sub-hourly output

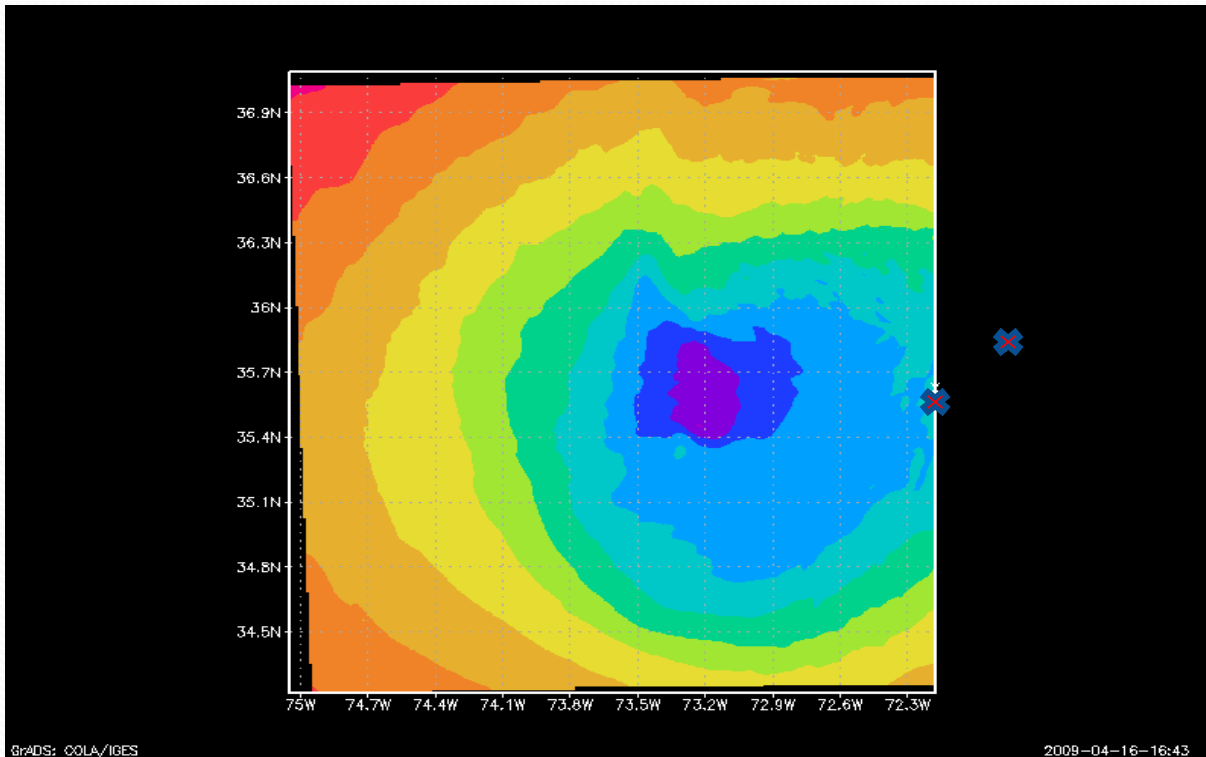
Outstanding Issues

When storm is weak and disorganized.



Outstanding Issues

When storm is on a very limited size grid and furthermore is skewed off to the one side of the grid



Possible solutions:

- 1) Tim has provided us code to fix this , DTC will implement it soon
- 2) Interpolate the inner nest grid to the outer domain, and use tracker to track outer domain (as in HWRF and GFDL operational)