COMPARATION OF ERROR ANALYSIS IN 3D-VAR FOR ASSIMILATION OF RADIANCES AND RETRIEVALS USING NOAA-14

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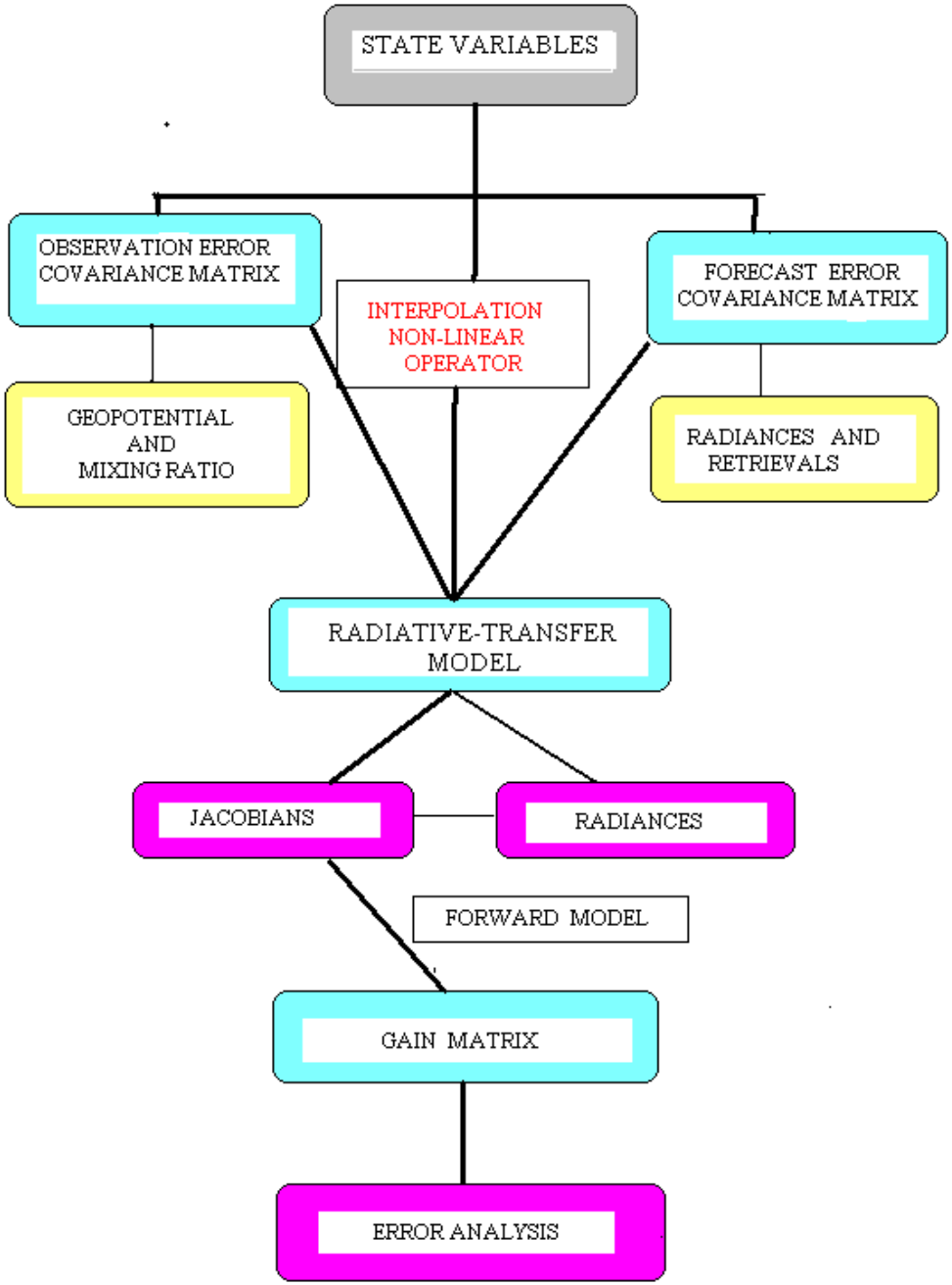
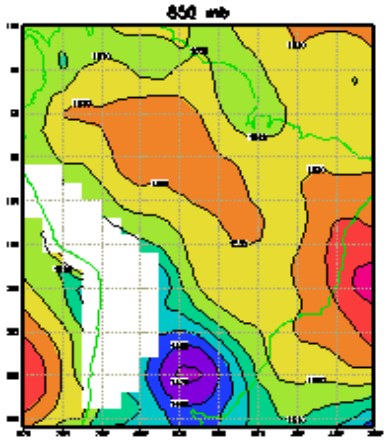
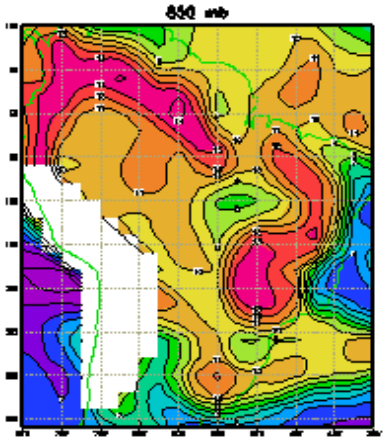

STATE VARIABLES
OBSERVATION ERROR COVARIANCE MATRIX
INTERPOLATION NON-LINEAR OPERATOR
FORECAST ERROR COVARIANCE MATRIX
GEOPOTENTIAL AND MIXING RATIO
RADIANCES AND RETRIEVALS
RADIATIVE-TRANSFER MODEL
JACOBIANS
RADIANCES
FORWARD MODEL
GAIN MATRIX
ERROR ANALYSIS

STATE VARIABLES

- **FONT:** Modelo GEOS DAO/NASA
- **TIME:** 00:00 e 12:00UTC
- **AREA:** 10°N-35°S e 35°W-80°W
- **RESOLUTION:** 2°x2.5°

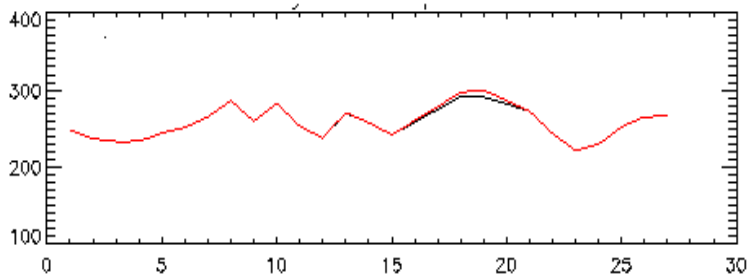


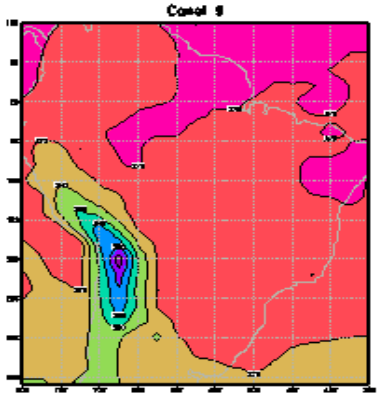
GEOPOTENTIAL

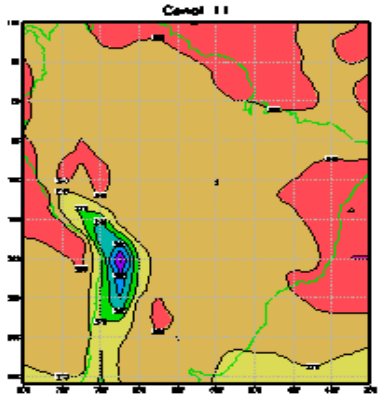


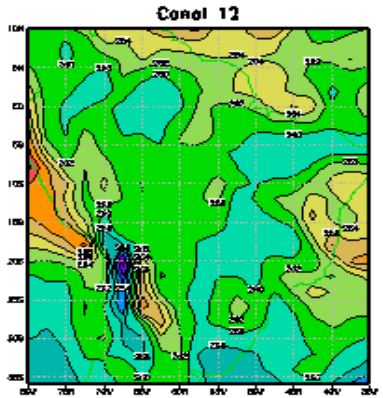
HUMIDITY

SIMULATED RADIANCES









ERROR COVARIANCE MATRIX

HORIZONTAL CORRELATION

$$\rho_{,i,j} = 1.0/(1+0.5\,(rdist/L)^2)$$

VERTICAL CORRELATION

$$\nu_{i,j} = \exp(-[\log(p_i / p_j)/D]^2)$$

DIAGONAL OF THE SQUARE MATRIX

$$P^f(i,j) = \sigma_{i,j}{}^2 \qquad P^f(i,j) = \sigma_i.\sigma_j.\nu_{i,j}.\rho^{i,j}(r)$$

FORECAST	**OBSERVATION**			
	CONVENTIONAL		**SATELLITE**	
$\nu^{(mn)} \neq 0$	**GEPOTENTIAL**	**HUMIDITY**	**RADIANCES**	**RETRIEVALS**
$\rho^{(mn)}(r) \neq 0$	$\rho^{(mn)}(r) = 0$	$\rho^{(mn)}(r) = 0$	$\rho^{(mn)}(r) = 0$	$\rho^{(mn)}(r) = 0$
	$\nu^{(mn)} \neq 0$	$\nu^{(mn)} = 0$	$\nu^{(mn)} = 0$	$\nu^{(mn)} \neq 0$

RESUME OF THE EQUATIONS

FORECAST ERROR COVARIANCE MATRIX

$$P^f$$

OBSERVATION ERROR COVARIANCE MATRIX

$$R$$

GAIN MATRIX FOR RADIANCES

$$K = P^f I^T F^T (FIP^f I^T F^T + R^y)^{-1}$$

GAIN MATRIX FOR RETRIEVALS

$$D_y = IP^f_{1D} I^T F^T (FIP^f_{1D} + R^y)^{-1}$$

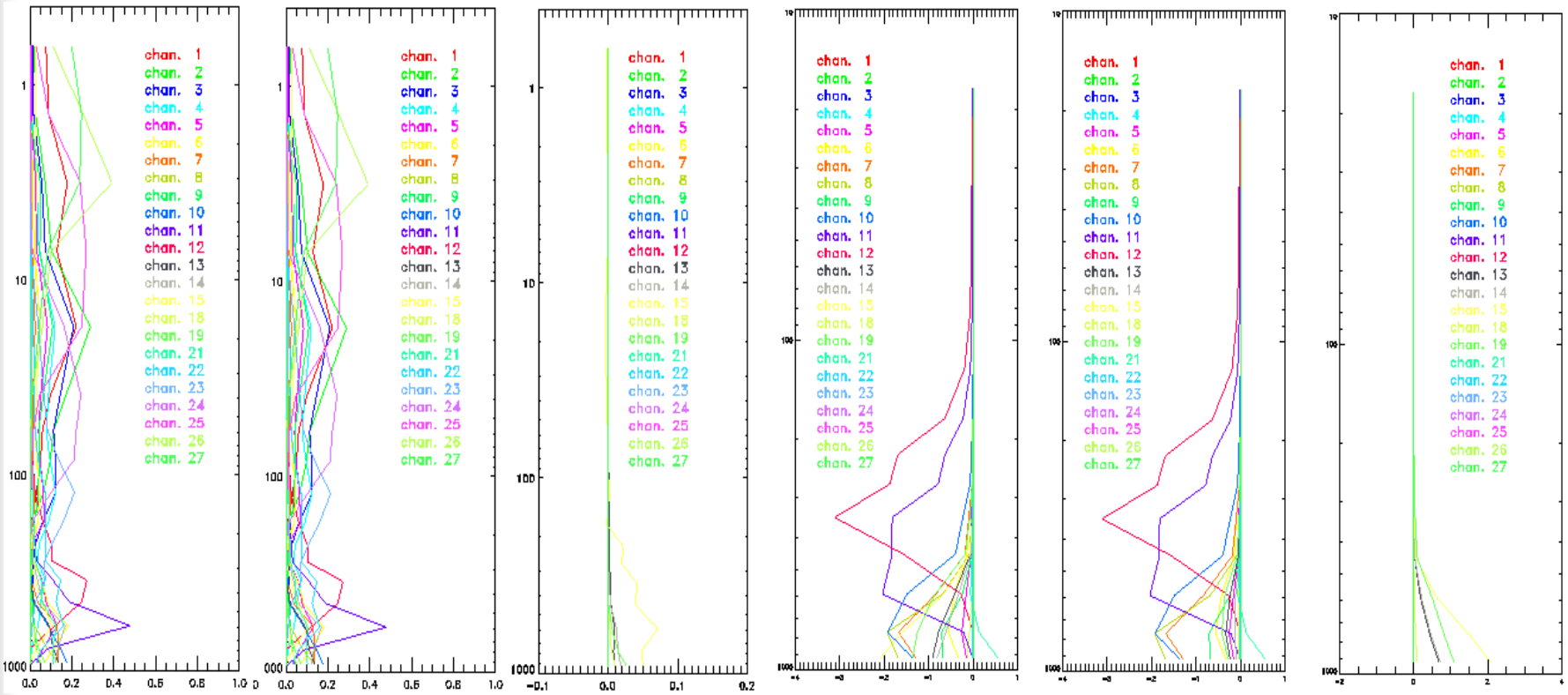
$$R^z = (I - D_y F) IP^f_{1D} I^T + (I - D_y F) I (P^f - P^f_{1D}) I^T (I - D_y F)^T$$

$$K^z = P^f I^T (IP^f I^T + R^z)^{-1}$$

ANALYSIS ERROR FOR RADIANCES AND RETRIEVALS

$$P^a = (\mathrm{I} - K^z D_y FI) P^f (\mathrm{I} - KD_y FI)^T + K^z D_y R^y (K^z D_y)^T$$

JACOBIANS

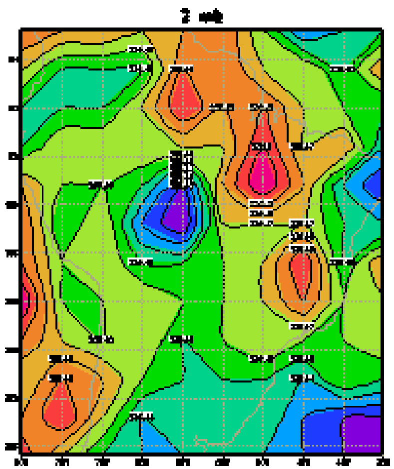


TEMPERATURE HUMIDTY

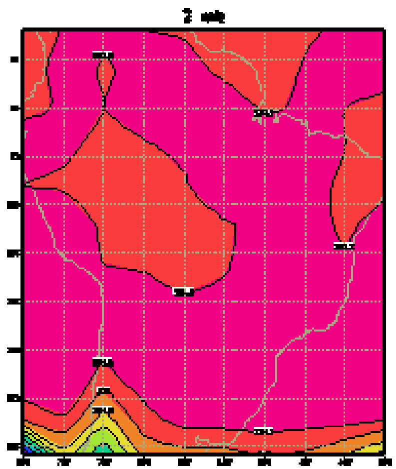
LEVELS	TEMPERATURE	HUMIDITY	OZONE
0.4	1,24,		
1	1,23,24		
2	1,2,22,23,24		
5	1,2,3,22,23,24		
10	2,3,22,23		
30	2,3,22		9
50	2,3,4		9
70	20		9
100	20		9
150	12, 19		9
200	11,12, 19		9
250	12		9
300	12,19	12	
400	11,12	1,2,3,4,11,12	
500	5,6,7,8,10,11,12,14, 15,16,18,19	11,12	
700	5,6,7,8,10,11,12,14, 15,16,18,19	5,6,7,8,9,10,11,12,18,19	
850	7,8,10,11,13,14,15,16, 17,18,19	5,6,7,8,9,10,11,12,18,19	
1000	7,8,10,11,13,14,16,17, 18,19	5,6,7,8,9,10,11,12,18,19	

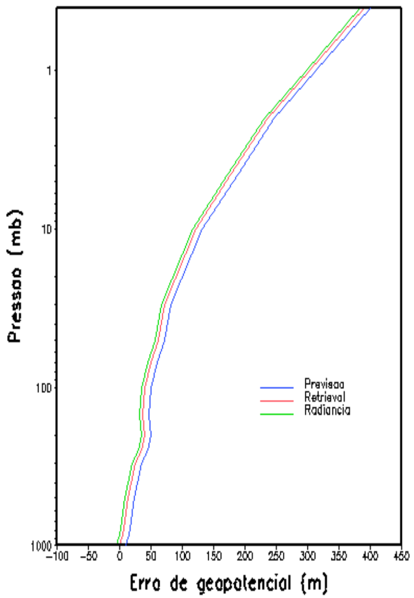
GEOPOTENTIAL

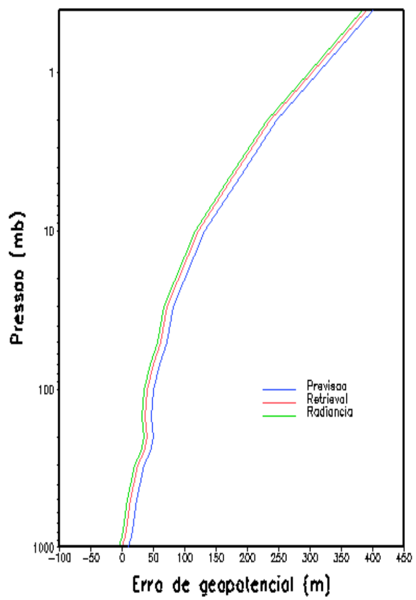
RETRIEVALS

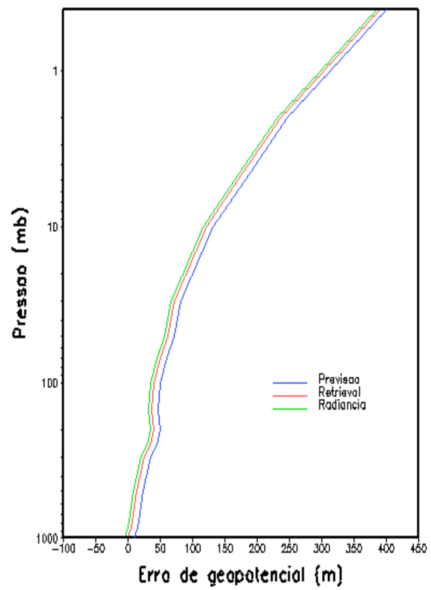


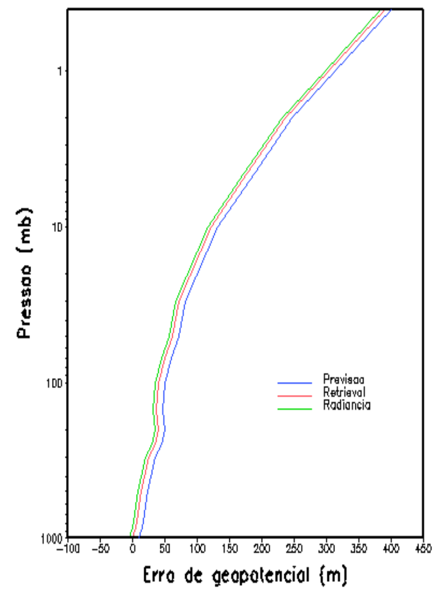
RADIANCIAS



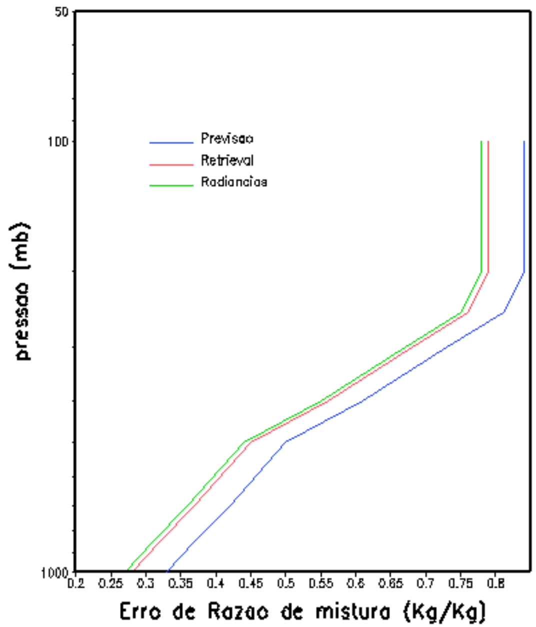


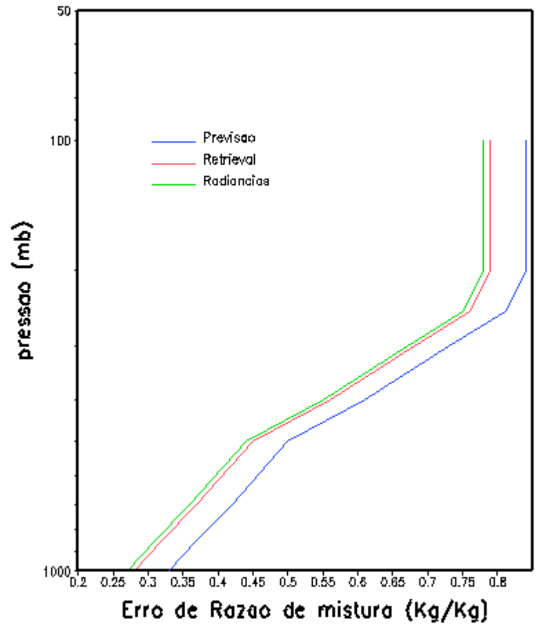


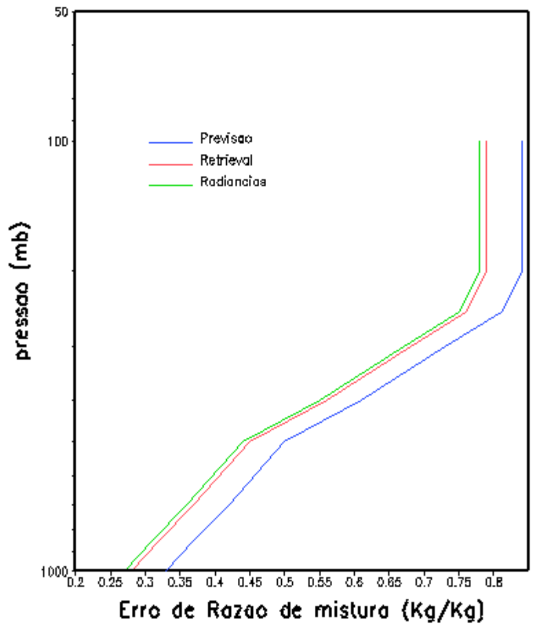


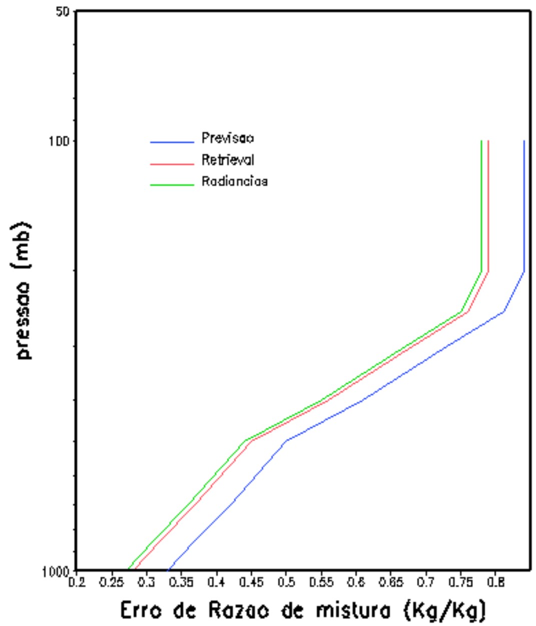


MIXING RATIO









CONCLUSIONS

- **Analysis error:** **The error analysis for directly assimilation is low that retrieval assimilation**
- **Computational cost :** **For a matrix the same size the CPU time for directly assimilation is low that retrievals assimilation.**
- **Differences:** **The difference between forecast error and analysis error for geopotential is high that for humidity.**
- **Assimilação of data satellite:** **we assumed the best way for South hemisphere, like radiances or retrievals**
- **TR, Jacobians.**