HUMIDITY PROFILES DETERMINED FROM SATELLITE SENSORS AND LIDAR

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So far as the laws of mathematics refer to reality, they are not certain. And so far as they are certain, they do not refer to reality.

—Albert Einstein

. K. Ya. Kondratyev, A. A. Buznikov and O. M. Pokrovsky, Global Change and Remote Sensing, Wiley-Praxis, 1996, p.269:

"…3. Optimization of Observing System…

…on the one hand, the data of direct (in situ) observations principally differ from the results of remote observations, which are indirect data. On the other hand, interpretation of space derived information without using data of in situ observations is very difficult…"

. Ernest Hilsenrath (NASA), Christopher J. Readings (ESA) and Jack A. Kaye (NASA), Integrated Global Observing Strategy (IGOS) for Ozone and Relevant Atmospheric Parameters:

"…Calibration and validation are critical to assure the scientific value of remote sensing measurements…

…Both Europe and the United States are now planning operational satellite systems that will carry ozone sounders… Japan is also committed to fly atmospheric chemistry missions. However despite the fact that the major space agencies have embarked on these missions, no concurrent long-term validation program, covering the life-time of these missions is being planned, nor is there any assurance that existing ground -based infrastructure will be in place when they are needed. Satellite systems can only meet the established requirements if they are supported by correlative data of known quality and continually challenged by reliable ground-based observations and quantitative science…"

. U. Gjertsen, M. Salek and D.B. Michelson, Gauge adjustment of radar-based precipitation estimates in Europe:

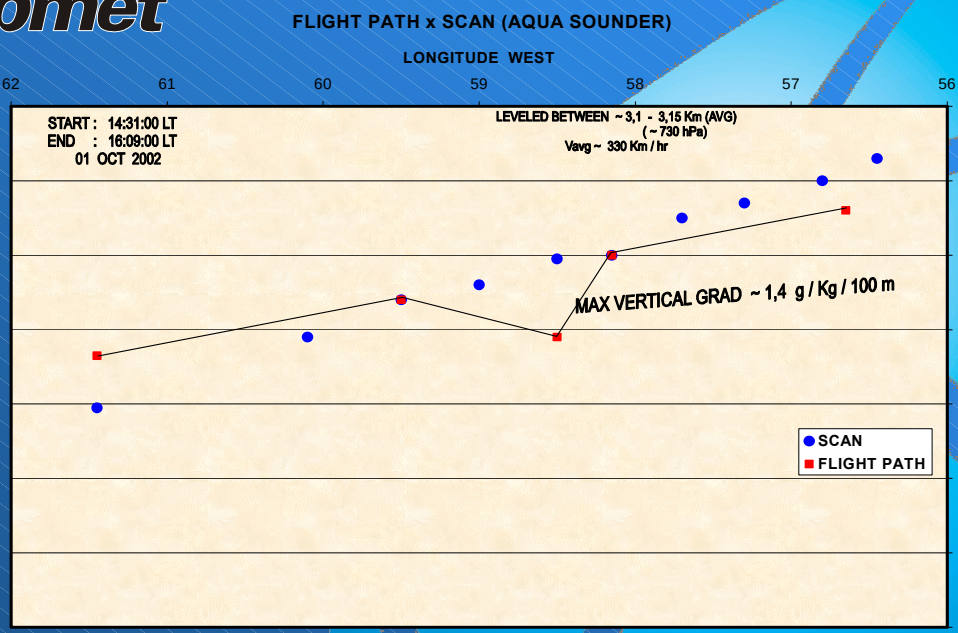
“…However, combining radar data with gauge measurement is a challenge stemming mostly from different sampling of the two instruments…”

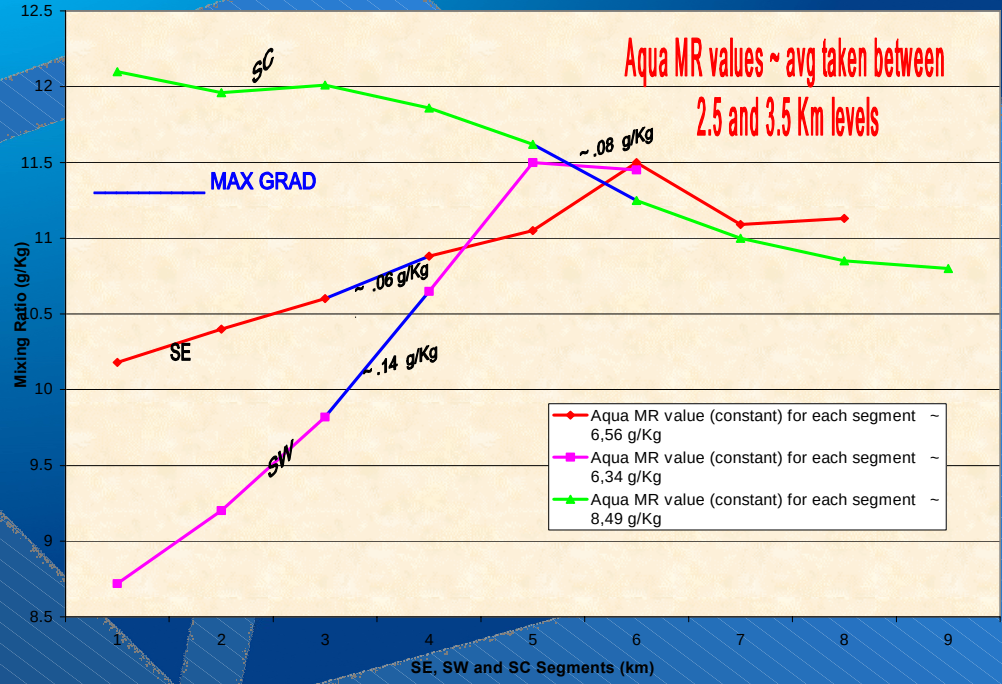
Third European Conference on Radar and Hydrology, Sweden, 6-10 September 2004

. Belinda Lipa, Soapbox , Sea Technology, September 2003

“…each radar cell contains different current velocities due to velocity shear on the ocean surface. The SeaSond averages over these velocities…

…when SeaSond and buoy measurements are compared, discrepancies are bound to exist in the presence of current shear…”


FLIGHT PATH x SCAN (AQUA SOUNDER)
LONGITUDE WEST
62
61
60
59
58
57
56
START : 14:31:00 LT
END : 16:09:00 LT
01 OCT 2002
LEVELED BETWEEN ~ 3,1 - 3,15 Km (AVG)
(~ 730 hPa)
Vavg ~ 330 Km / hr
MAX VERTICAL GRAD ~ 1,4 g / Kg / 100 m
SCAN
FLIGHT PATH
LATITUDE SOUTH
10,1
10,3
10,5
10,7
10,9
11,1
11,3
11,5


Aqua MR values ~ avg taken between
2.5 and 3.5 Km levels
SC
MAX GRAD
~ .08 g/Kg
~ .06 g/Kg
~ .14 g/Kg
SE
SW
Mixing Ratio (g/Kg)
12.5
12
11.5
11
10.5
10
9.5
9
8.5
1
2
3
4
5
6
7
8
9
SE, SW and SC Segments (km)
Aqua MR value (constant) for each segment ~ 6,56 g/Kg
Aqua MR value (constant) for each segment ~ 6,34 g/Kg
Aqua MR value (constant) for each segment ~ 8,49 g/Kg

Sample of Observations

ASSESSMENT OF THE HUMIDITY FIELD SMOOTHING BY SATELLITES:

Falcon DIAL

versus

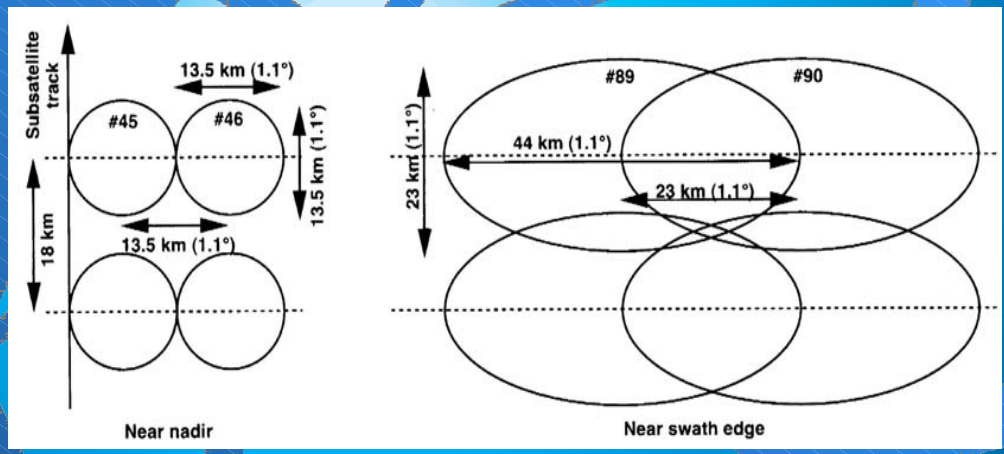
Satellites

Resolution - HSB 13,5 km

- AMSU-A 50 km

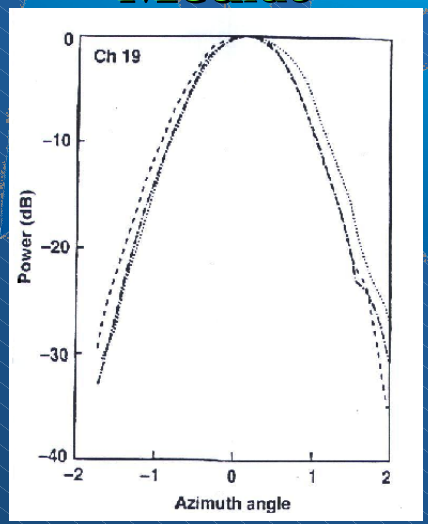
Características do Sensor

- Projeção da varredura no solo

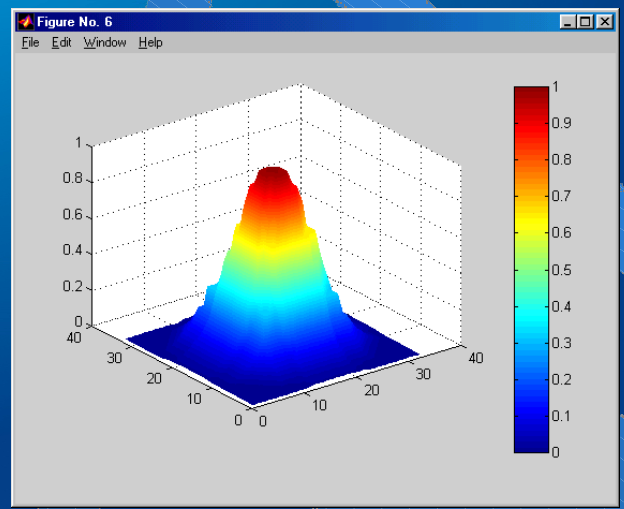


- Diagrama de Irradiação da Antena (AMSU-B/HSB; 1,1º)

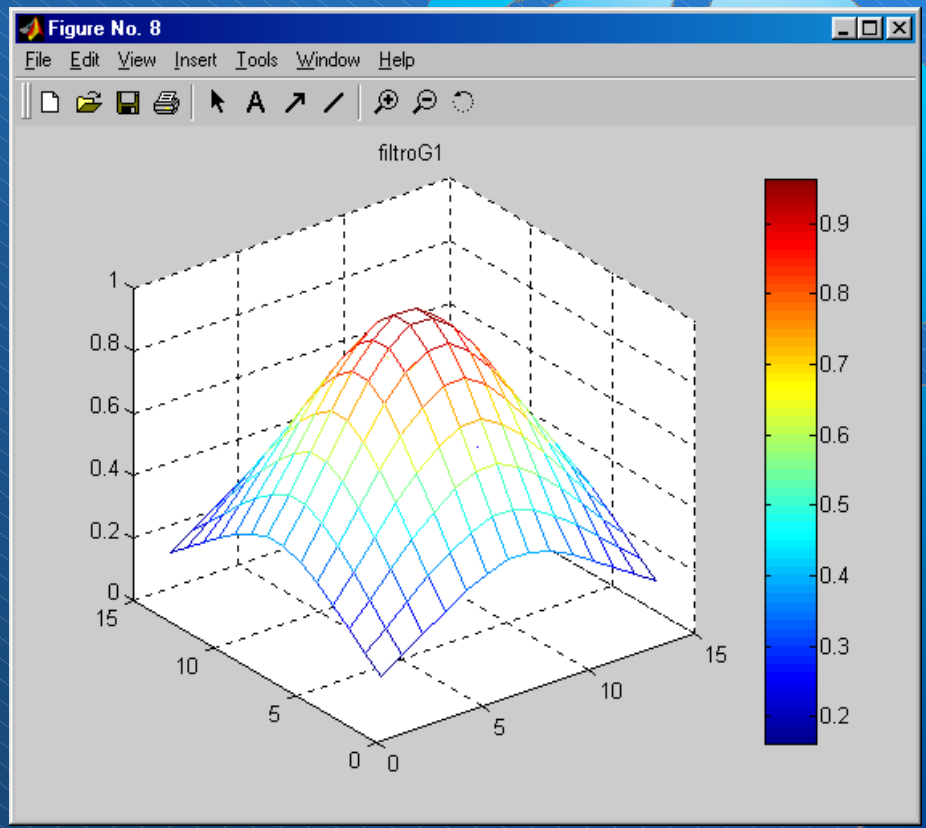
Medido

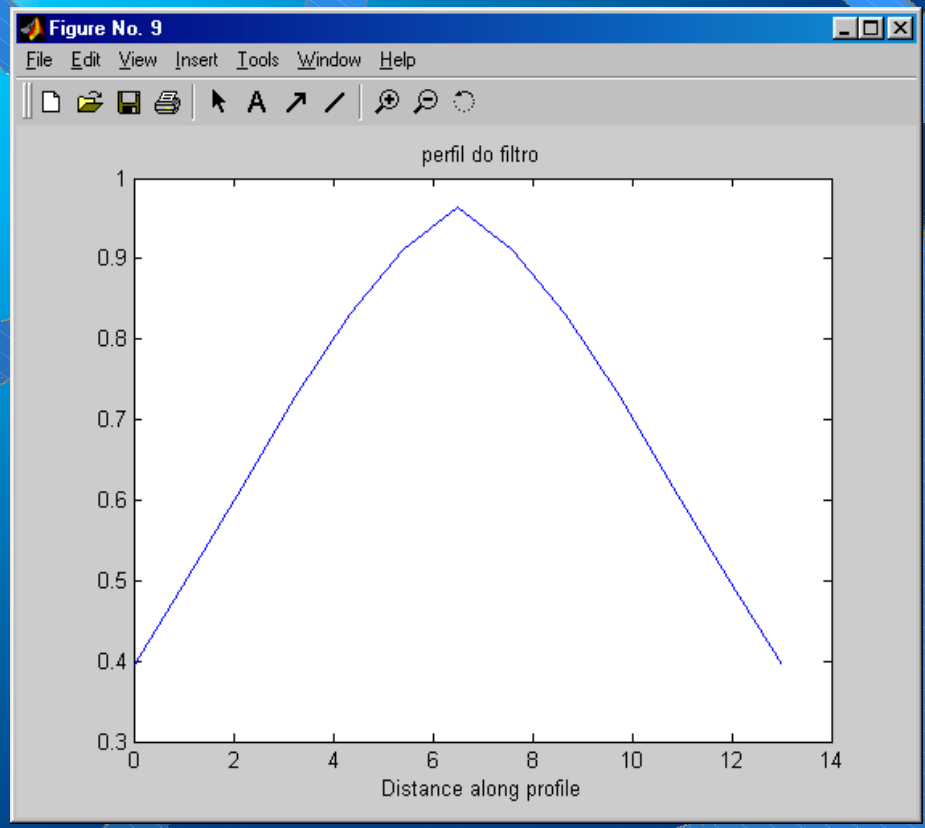


Simulado

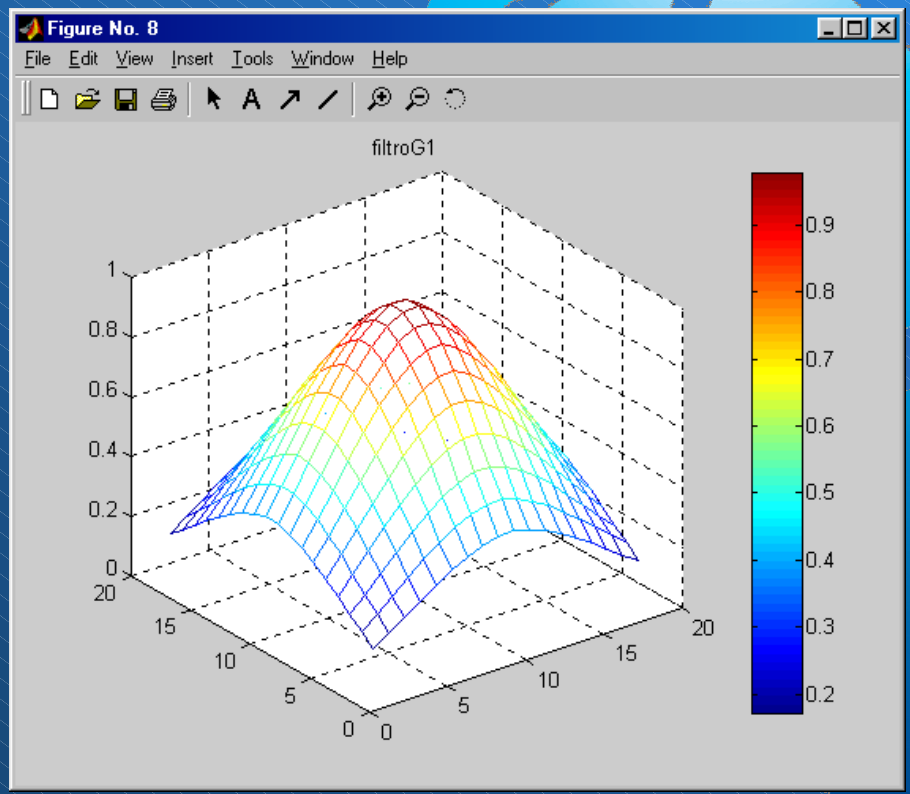


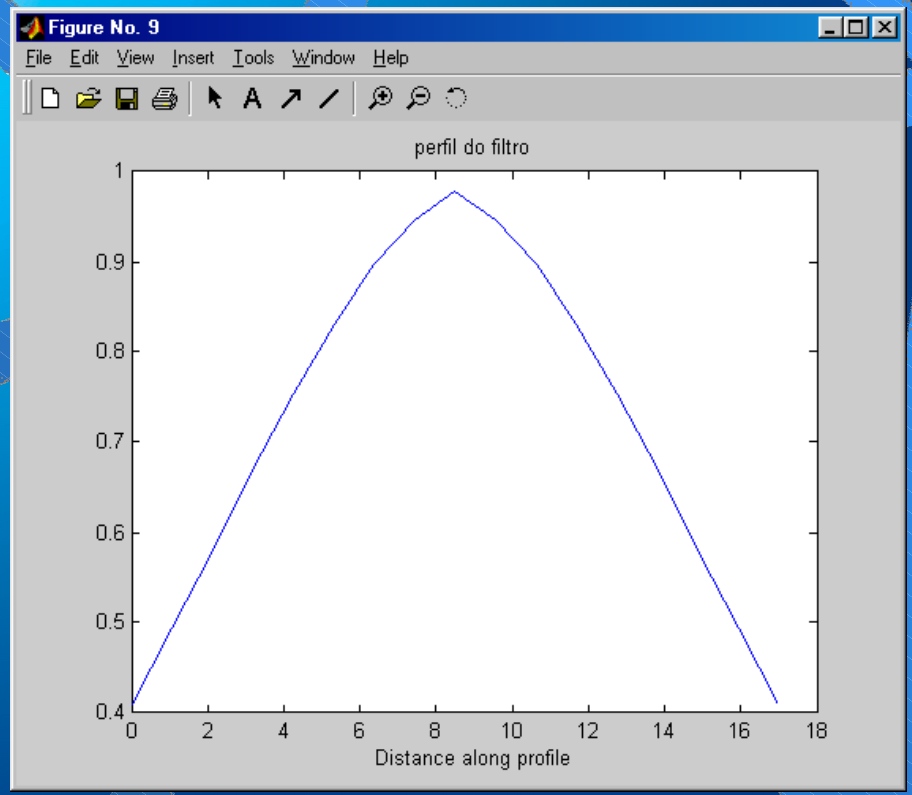
Filtro de Gabor
Sigma = 13



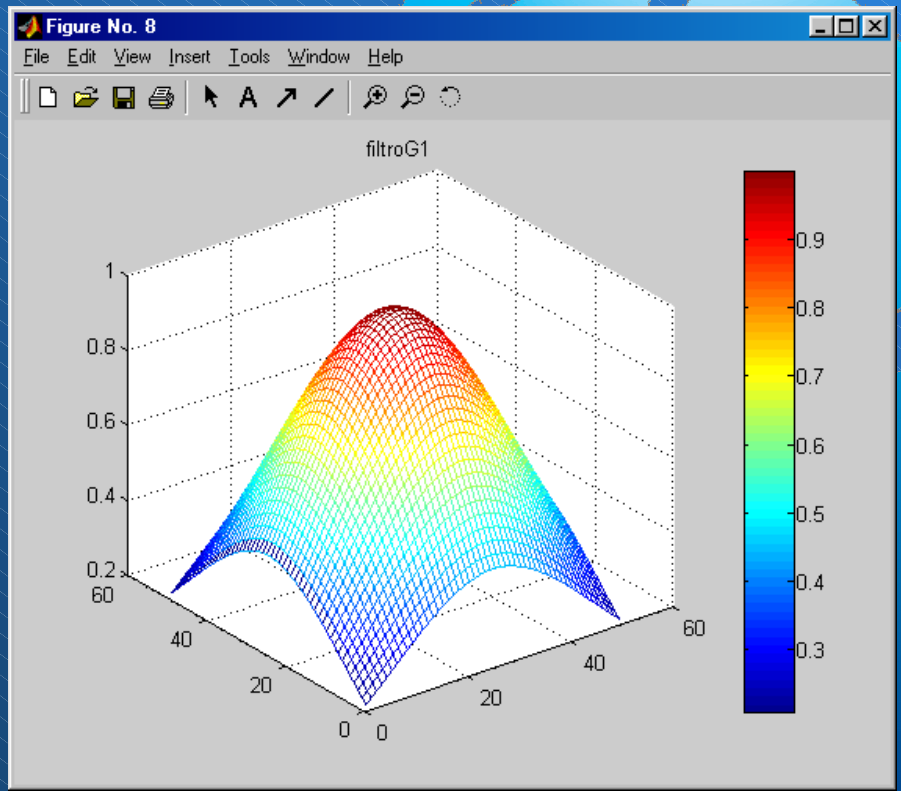


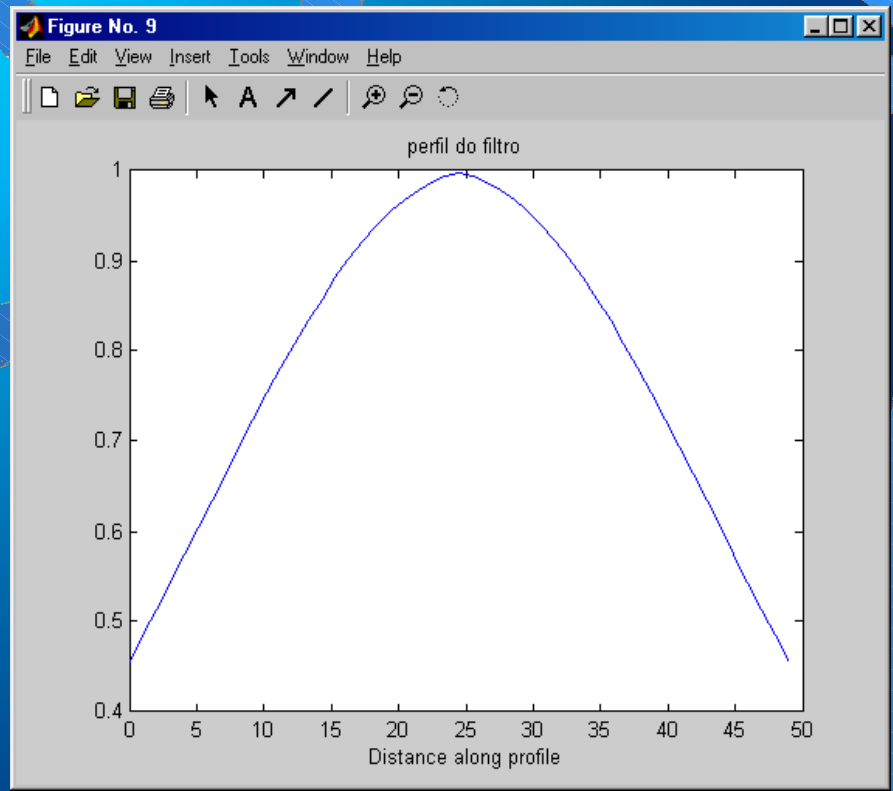
Filtro de Gabor
Sigma = 17





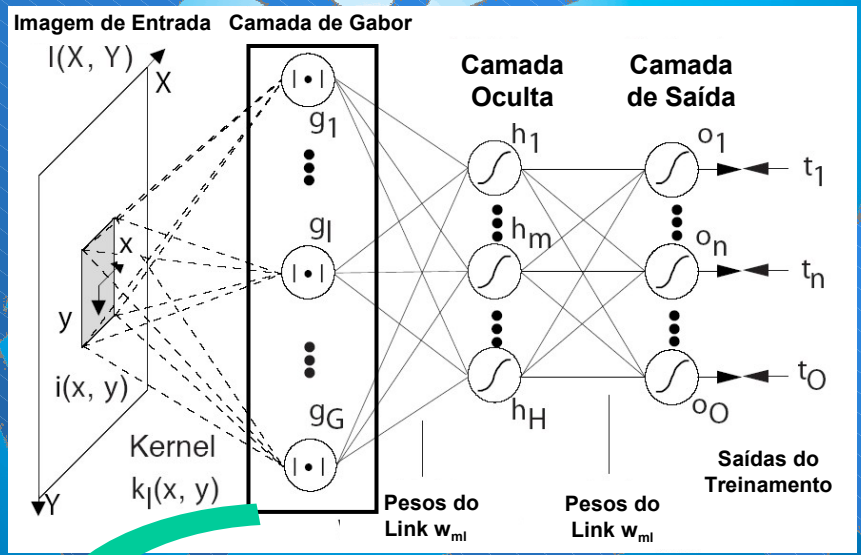
Filtro de Gabor
Sigma = 50





Filtragem de GABOR / Classificação de textura

- Rede Neural



- Camada de Gabor

$$G(x,y) = e^{\left\{-\pi\left[\left(\frac{x'}{\alpha}\right)^2+\left(\frac{y'}{\beta}\right)^2\right]\right\}} e^{\left(-2\pi\ j\right)\left[\mu_0 x'+v_0 y'\right]}$$

$x' = a^{-m} x_r - x_0$ $\quad$ $x_r = x \text{ as } \theta + y \text{ sen } \theta$

$y' = a^{-m} y_r - y_0$ $\quad$ $y_r = - x \text{ sen } \theta + y \cos \theta$

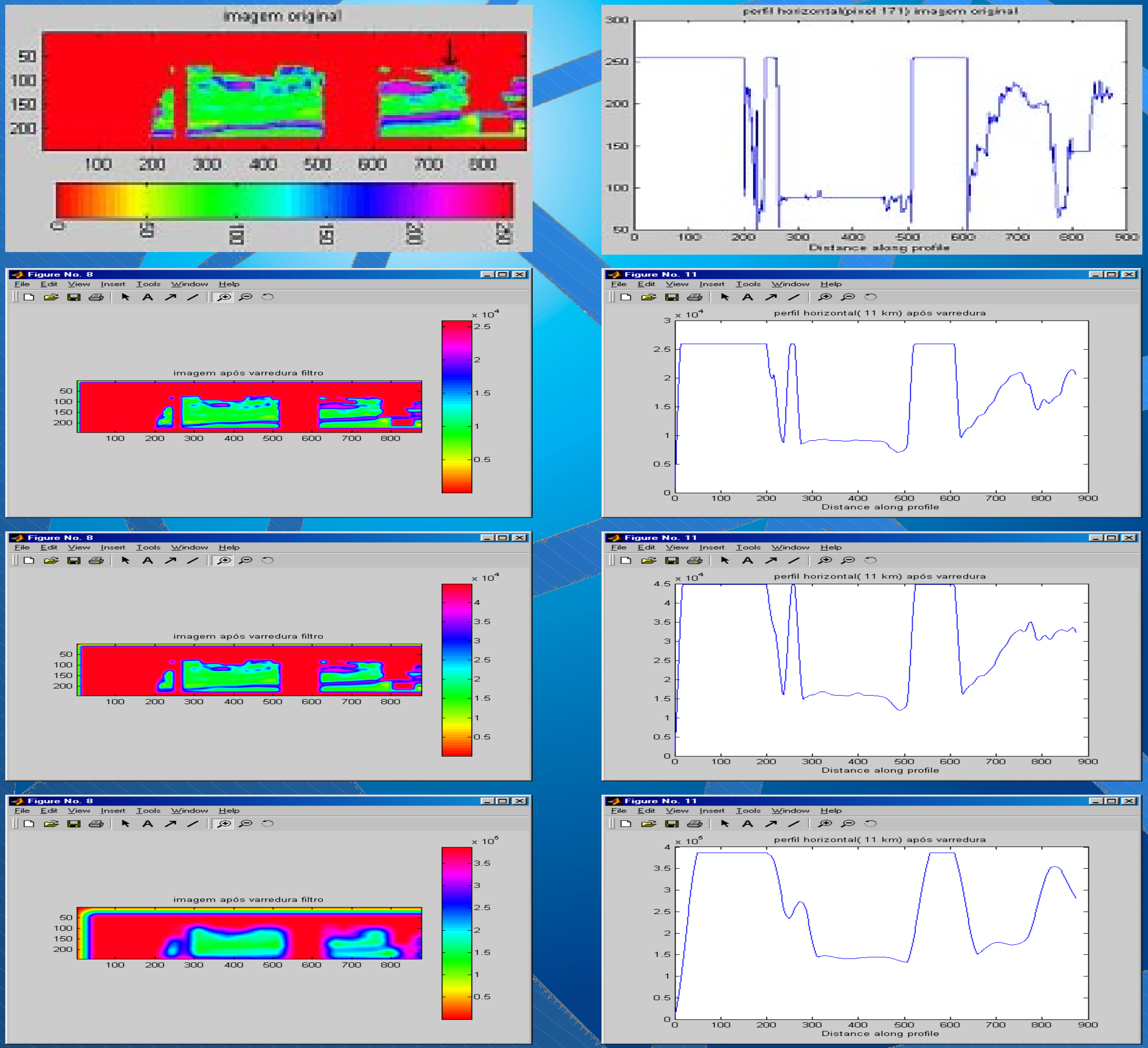
θ = ângulo de orientação

μ_0, v_0 = freqüências espaciais

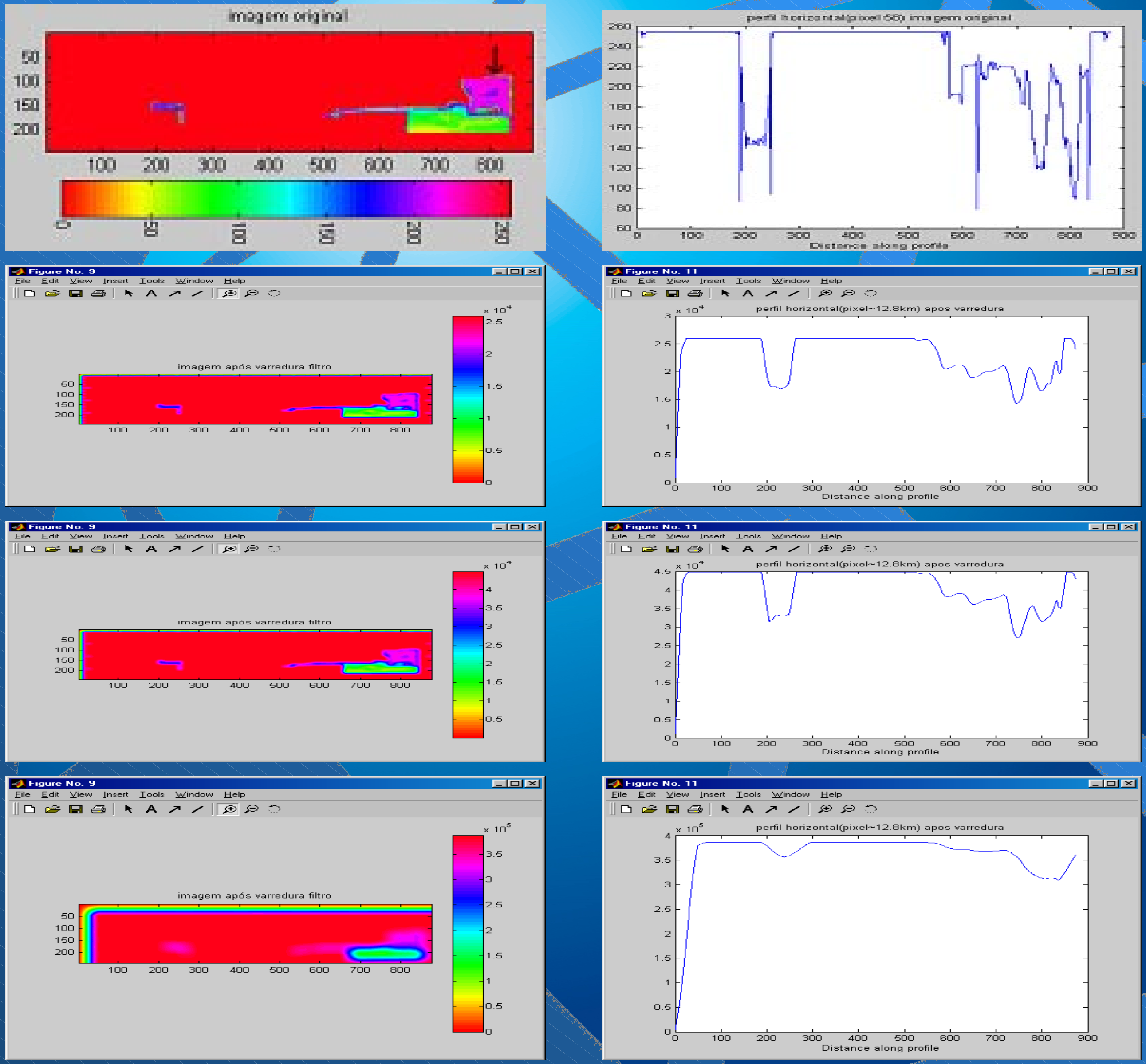
α,β = desvios-padrão da Gaussiana ao longo de x e y

ipmet

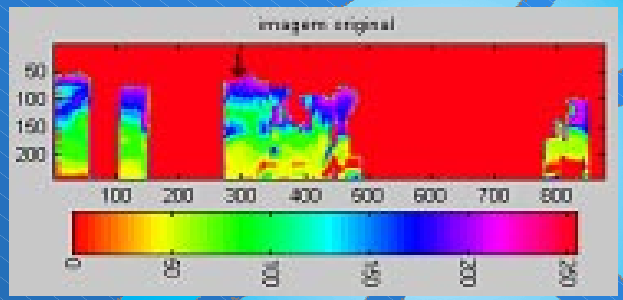
GABOR FILTERING, 17 FEBRUARY 2004, ORIGINAL & SIGMA = 13, 17 AND 50 KM

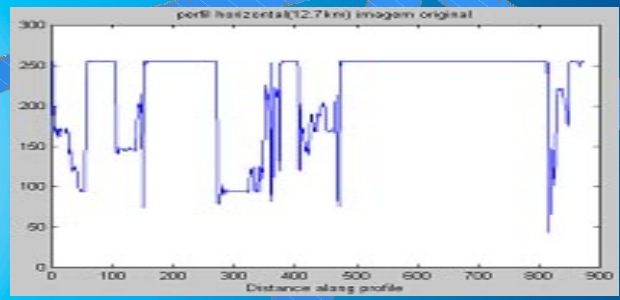


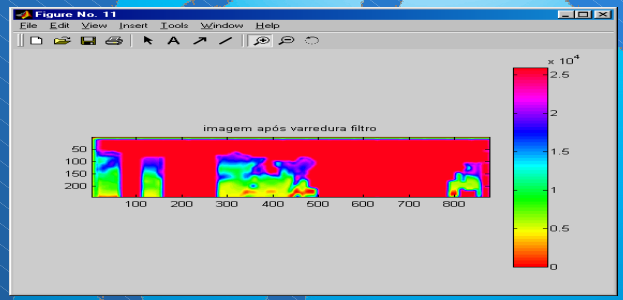
GABOR FILTERING, 19 FEBRUARY 2004, ORIGINAL & SIGMA = 13, 17 AND 50 KM

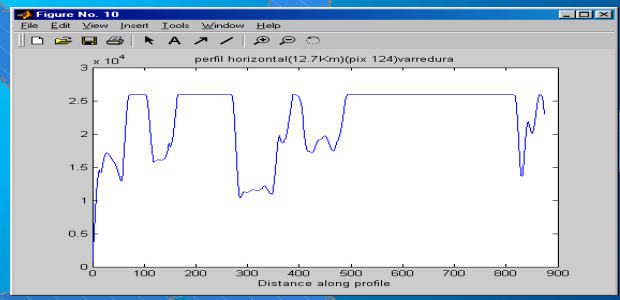


GABOR FILTERING, 04 March 2004, ORIGINAL & SIGMA = 13 AND 17 KM

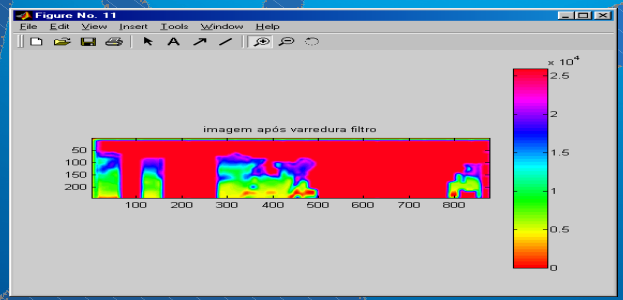


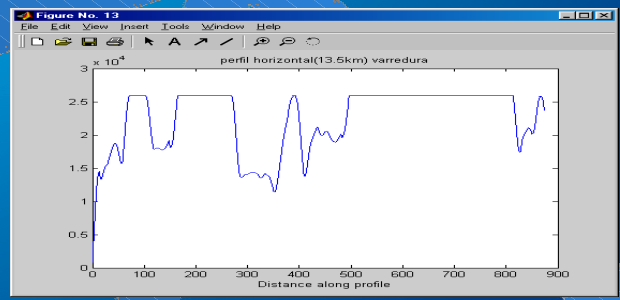




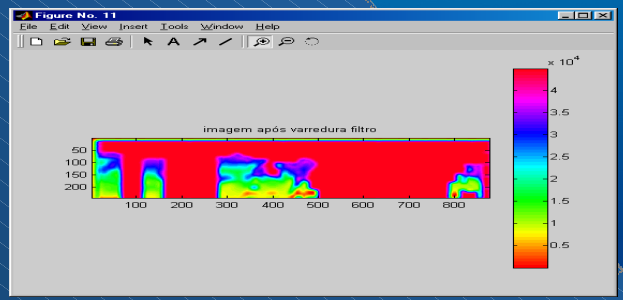


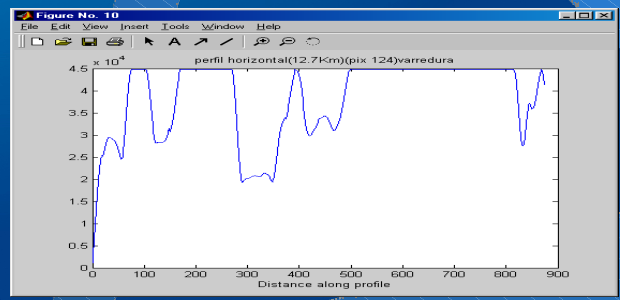
12.7 km





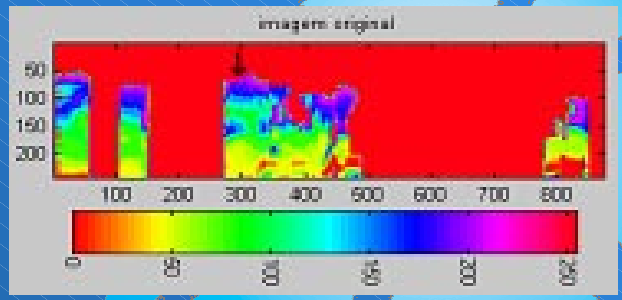
13.5 km

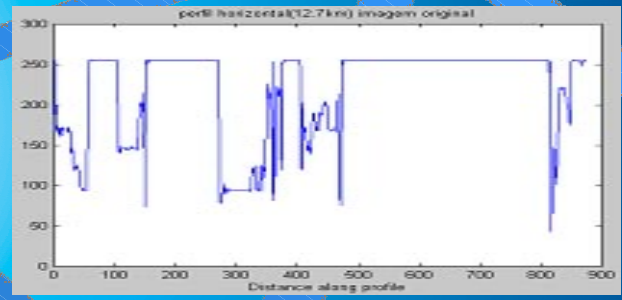


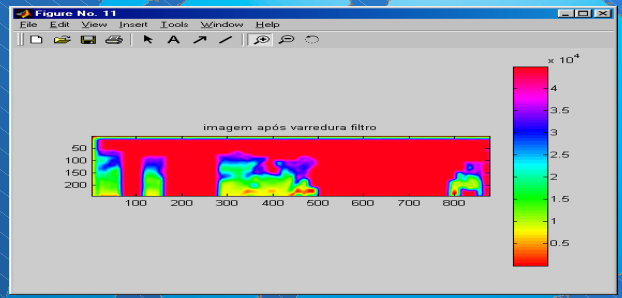


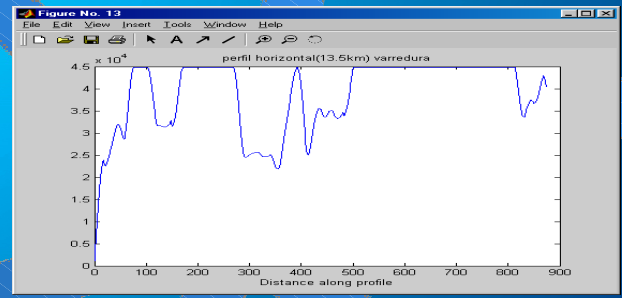
12.7 km

GABOR FILTERING, 04 March 2004, ORIGINAL & SIGMA = 17 AND 50 KM

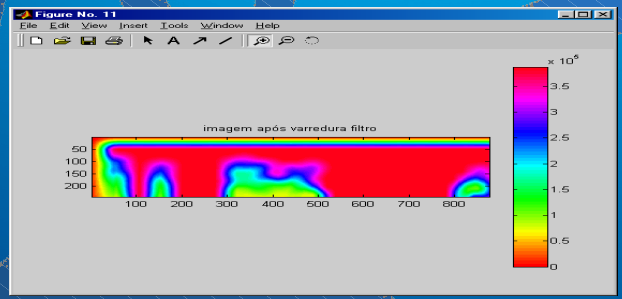


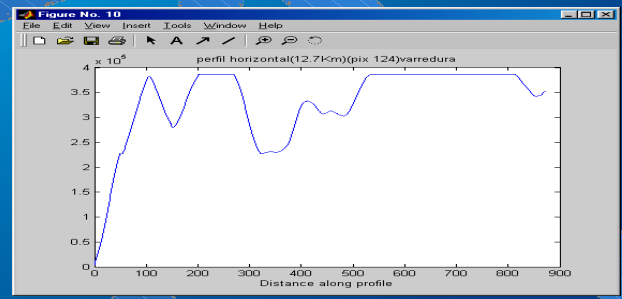






13.5 km





12.7 km