

Spatial verification via a true metric

M. Zhu, V. Lakshmanan, P. Zhang, Y. Hong,
K. Cheng and S. Chen

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1. Introduce to a new metric

$$\text{dist}_{ob}(O, A) = \frac{1}{N(O)} \sum_{i=1}^{N(O)} d(o_i, A).$$

$$\text{dist}_{DV}(A, B) = \text{dist}_{ob}(O, A) + \text{dist}_{ob}(O, B).$$

$$\text{dist}_{OV}(A, B) = \sqrt{\sum_i^m \sum_{j=1}^n (a_{ij} - b_{ij})^2}$$

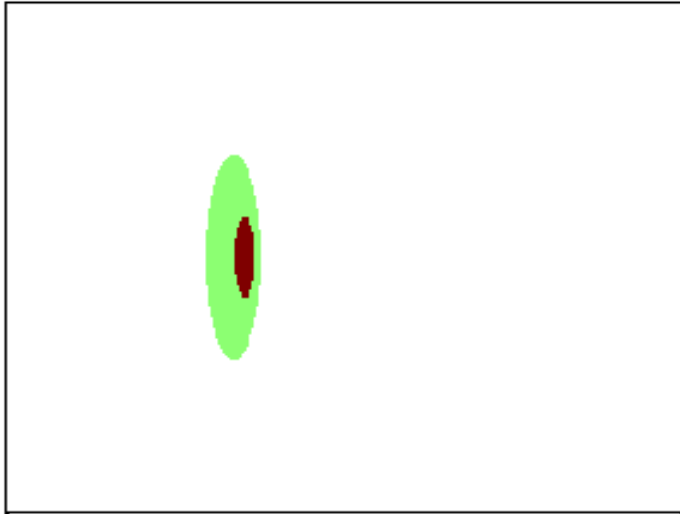
$$= \sqrt{\iint (\chi_A - \chi_B)^2 dx}.$$

$$\text{metr}_V(A, B) = \frac{1}{2} \text{dist}_{DV}(A, B) + \frac{1}{2} \text{dist}_{OV}(A, B).$$

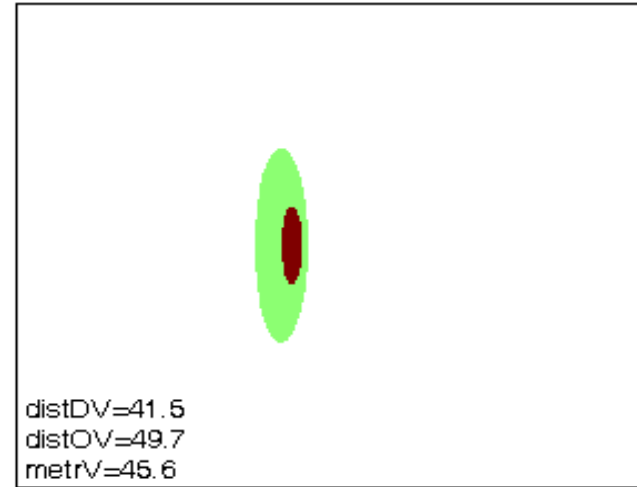
2.1 Experiment (1): understanding the metric

Data:Geometry

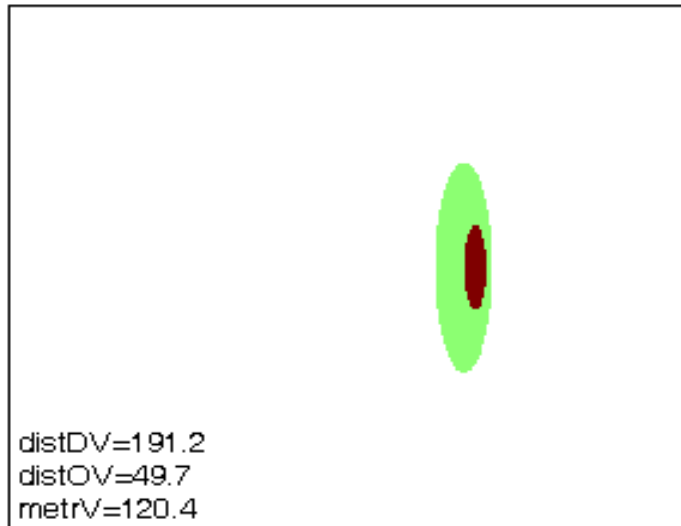
Observed



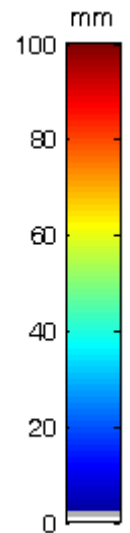
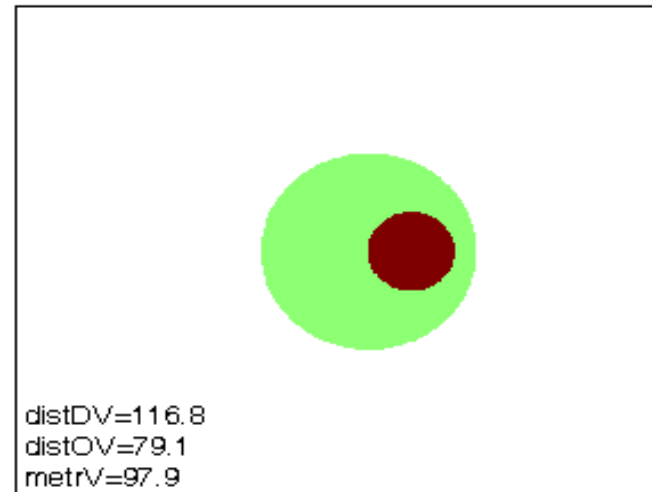
geom001



geom002



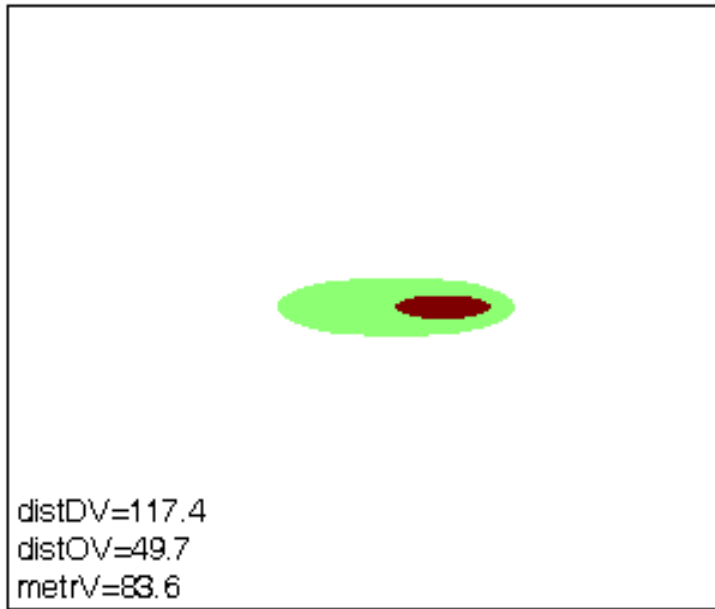
geom003



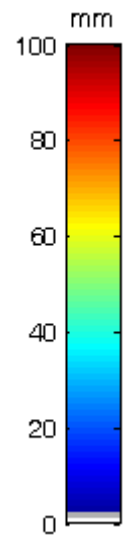
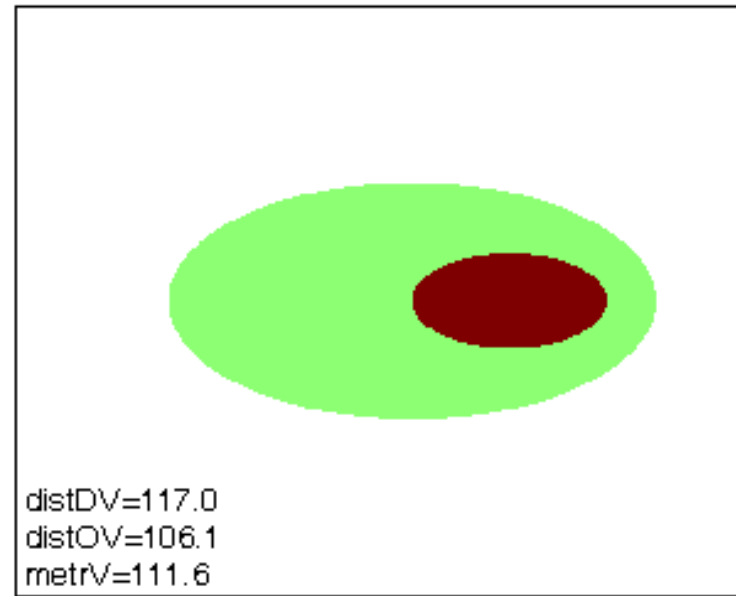
2.1 Experiment(1): understanding the metric, continuous

Data:Geometry

geom004

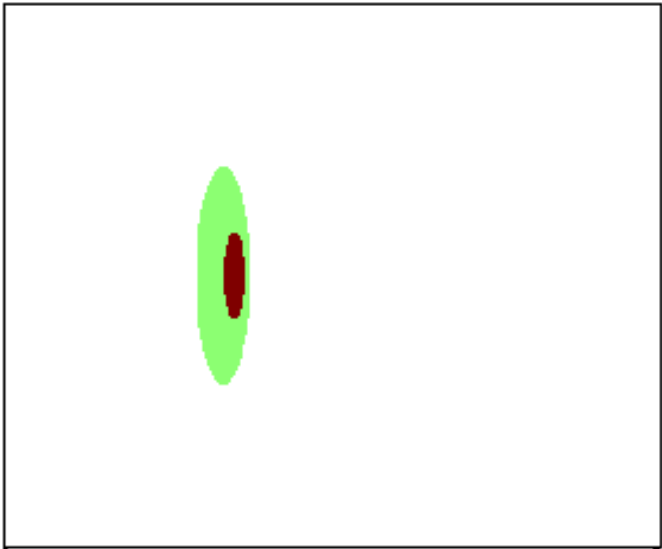


geom005

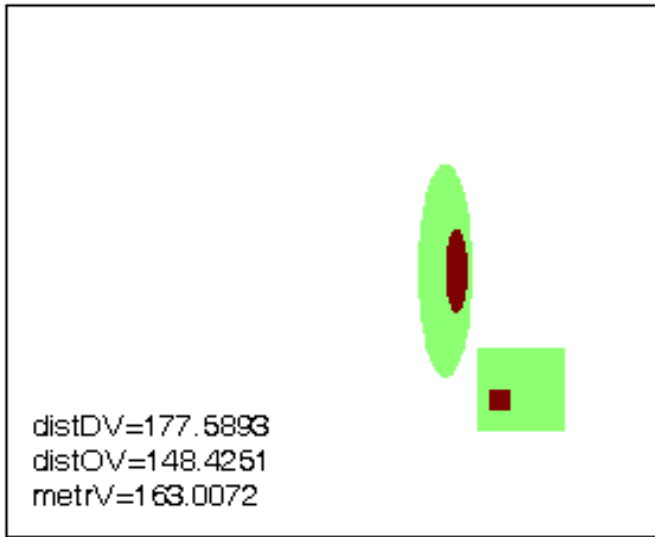


2.2 Experiment(2): understanding the metric

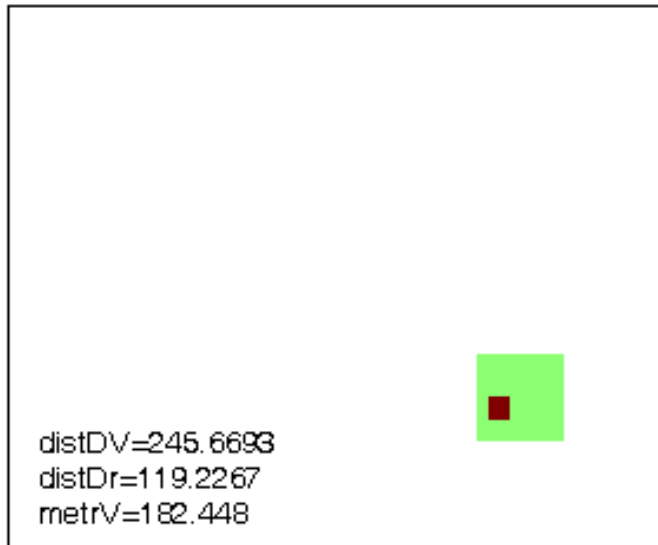
Observed



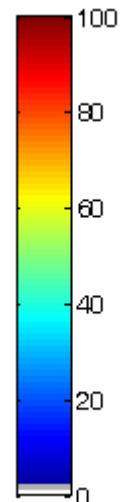
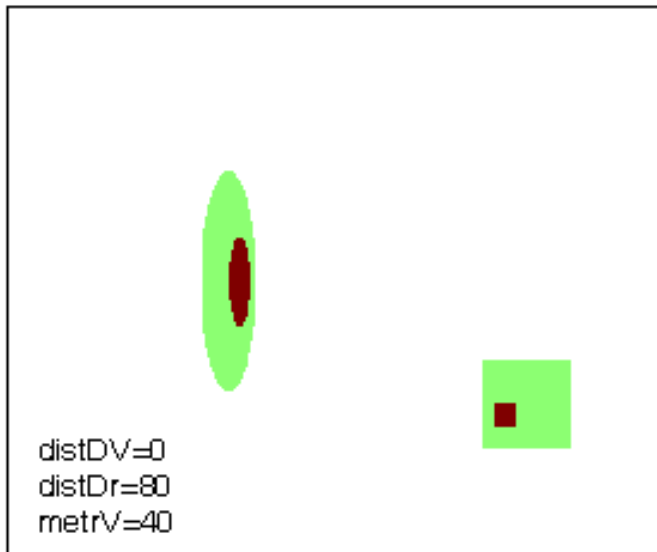
Forecast01



Forecast02

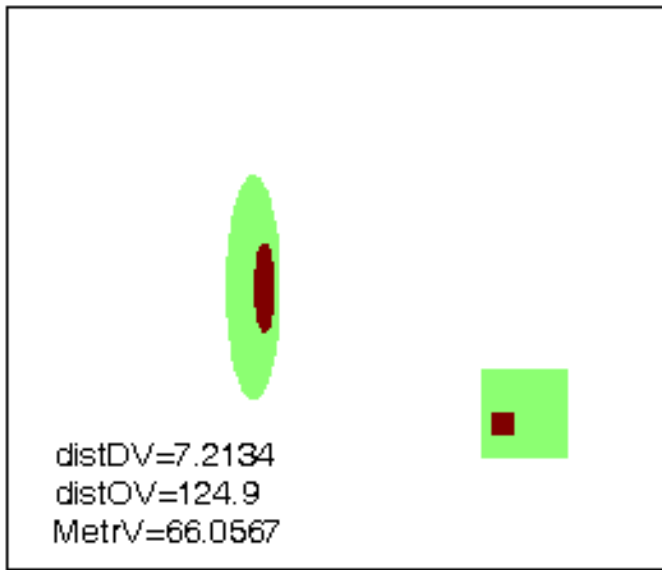


Forecast03

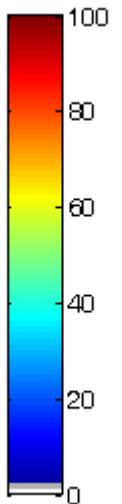
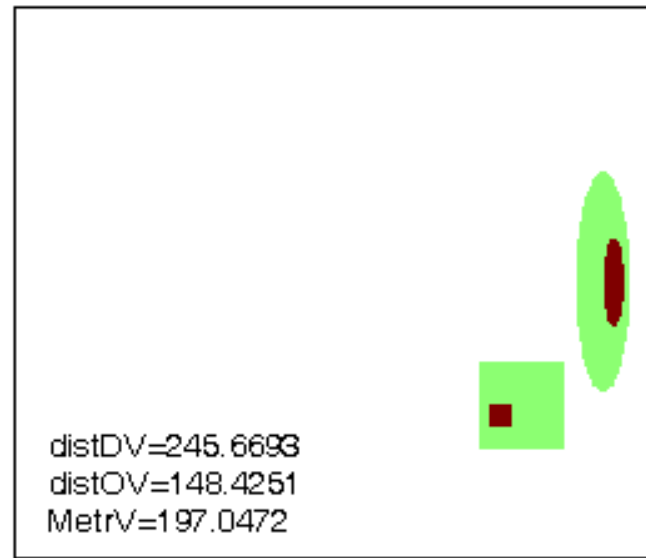


2.2 Experiment(2): understanding the metric, continuous

Forecast04



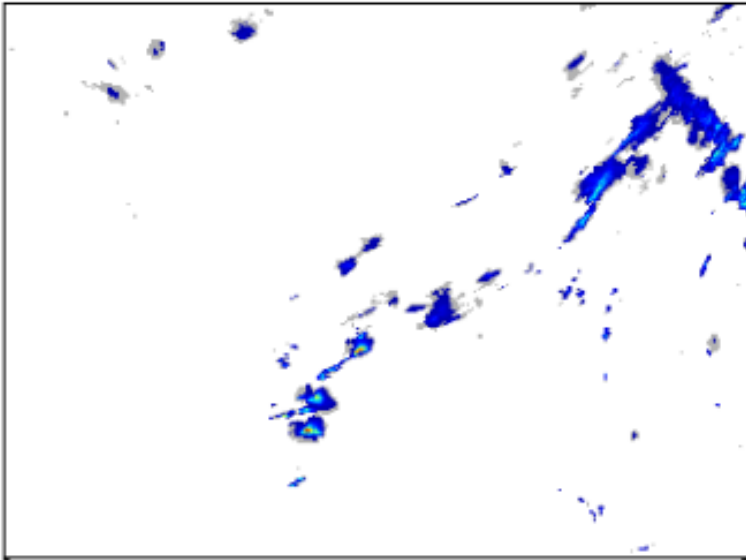
Forecast05



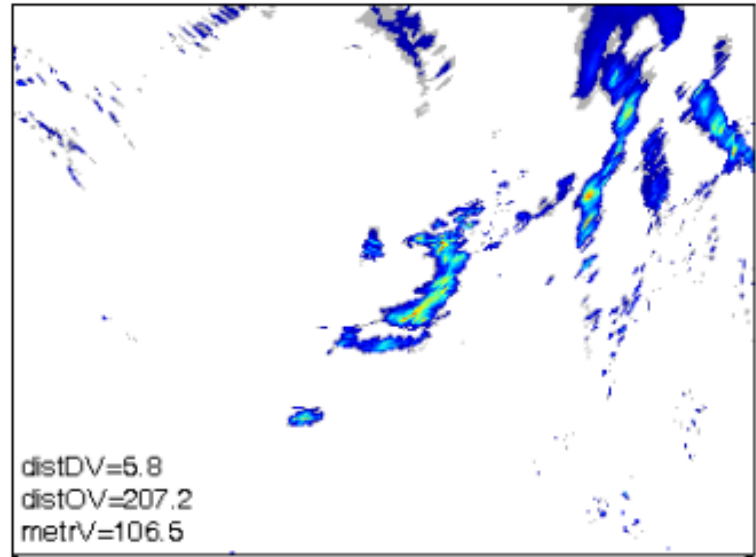
2. 3.1 Real data experiment(3)

Date:20050514 Threshold=0mm

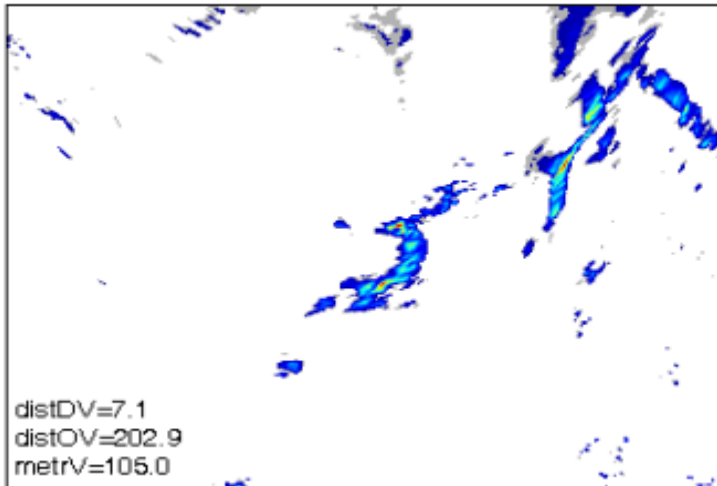
Observed



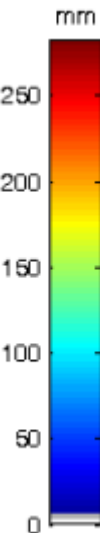
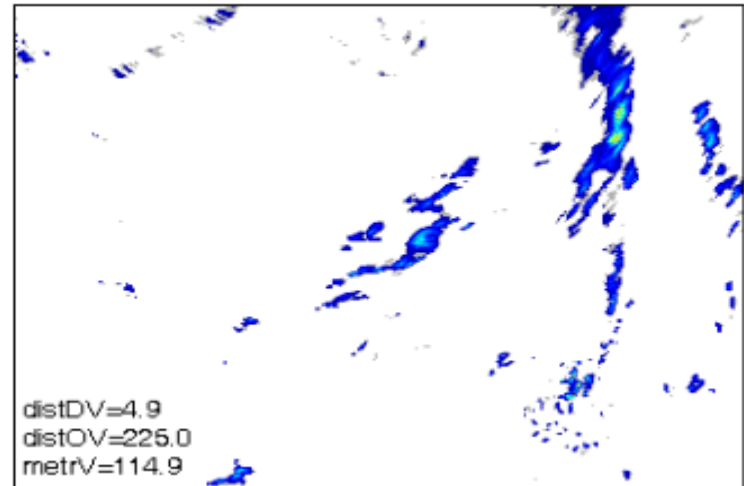
GAPS



NCAR

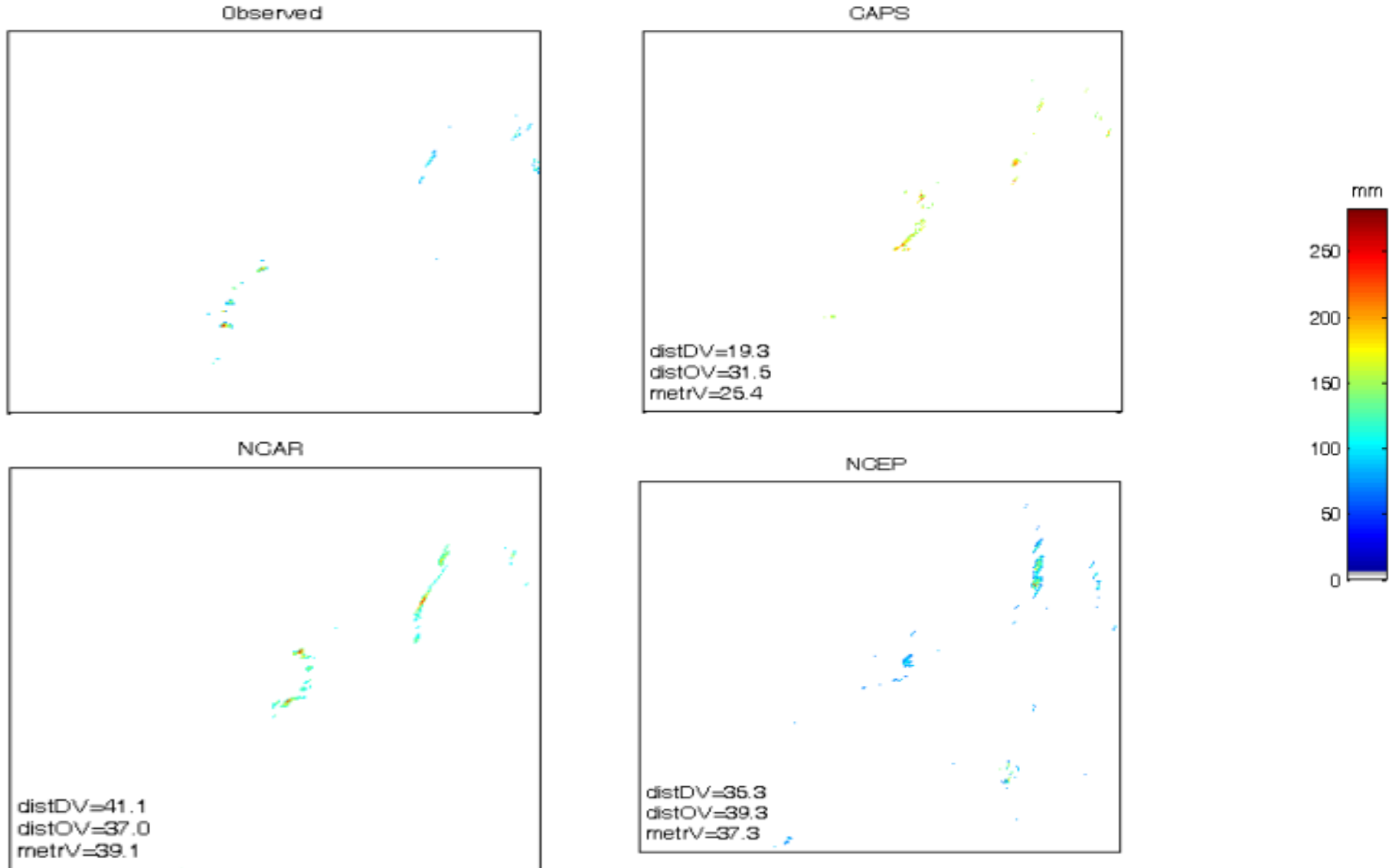


NCEP



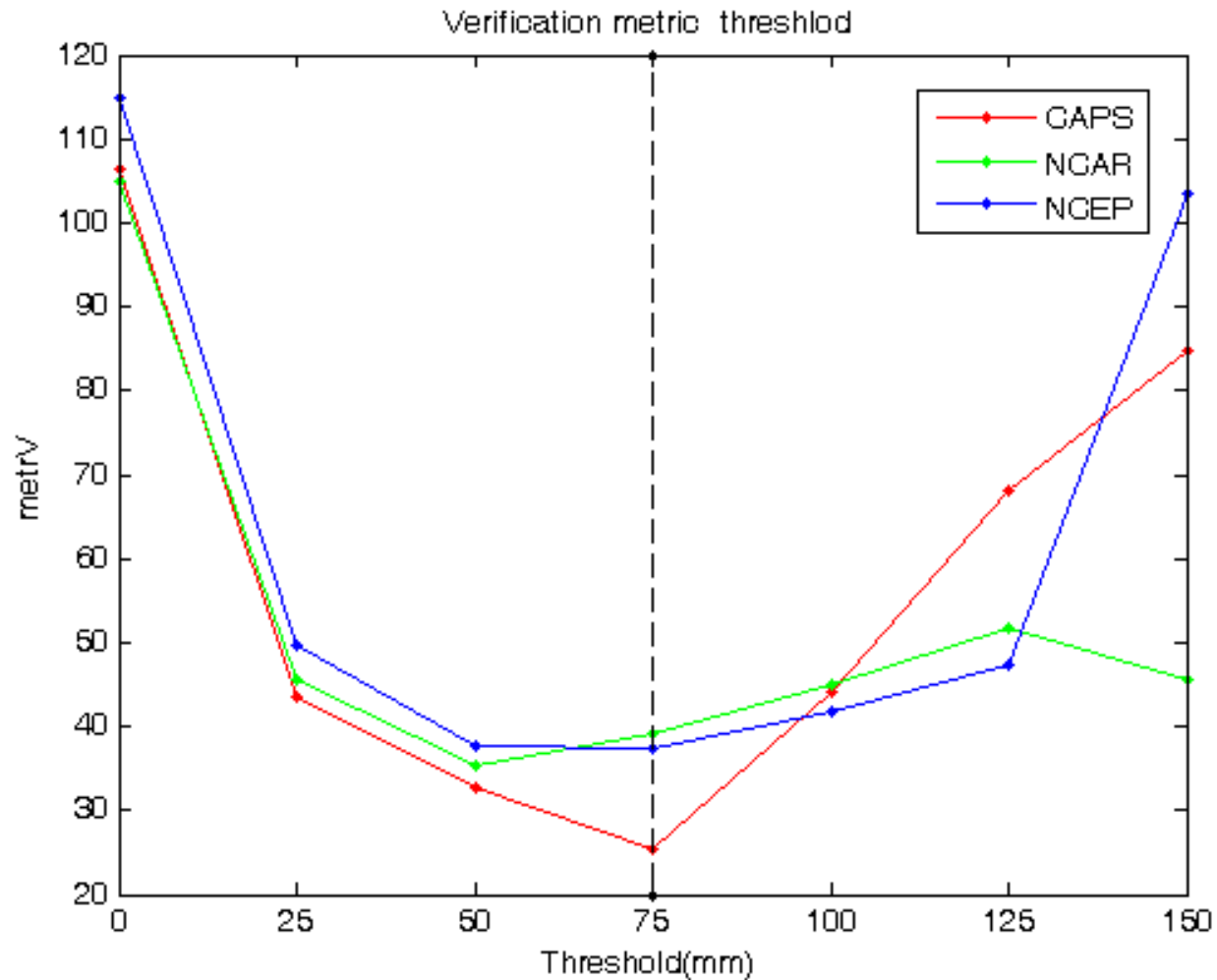
2.3.2 Real data experiment(3)

Date:20050514 Threshold=75mm



2.3.3 Diagram of distance with respect to precipitations.

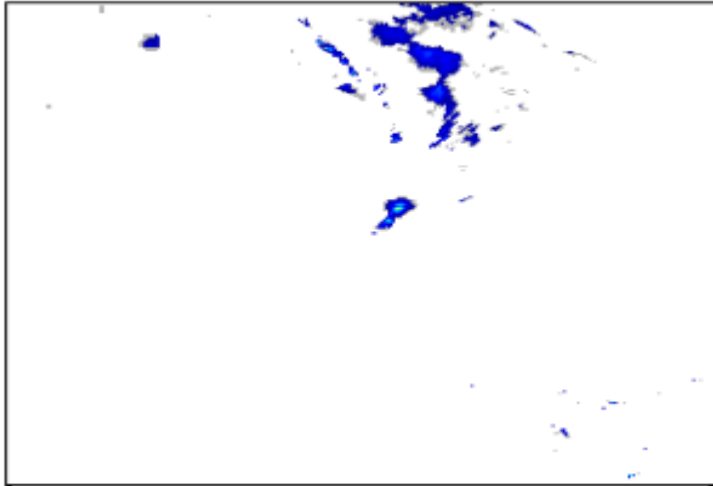
Date:20050514



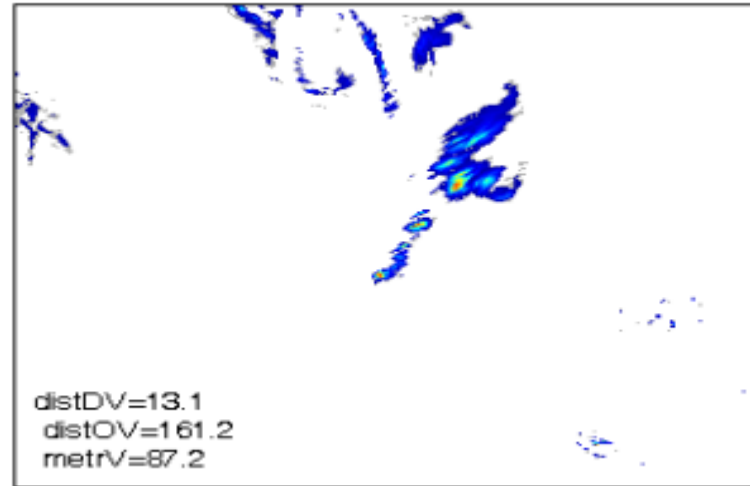
2.4.1 Experiment(4)

Date:20050519 Threshold=0mm

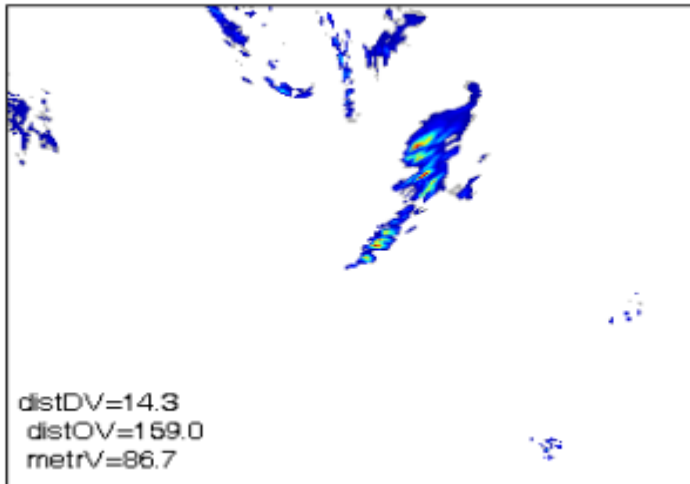
Observed



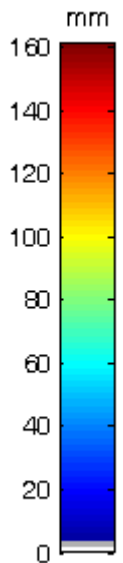
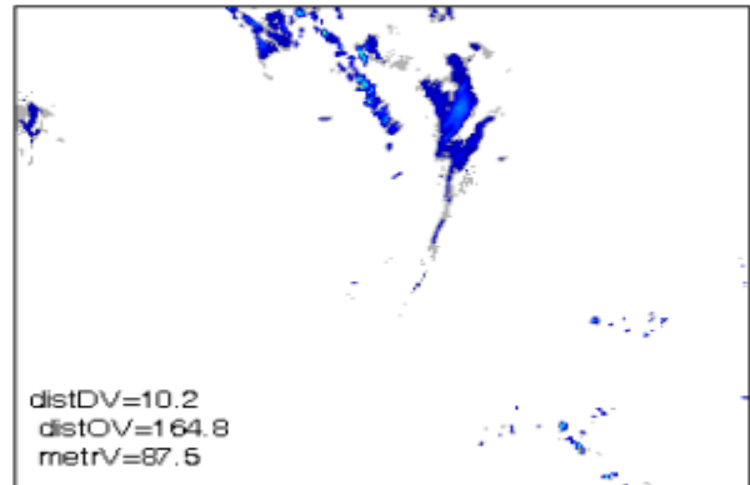
CAPS



NGAR



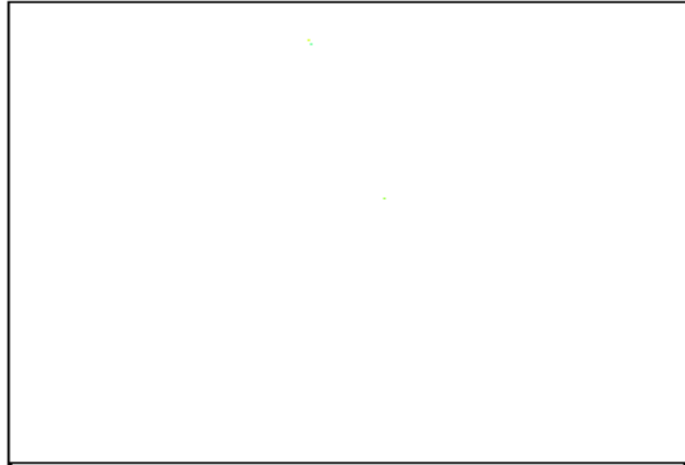
NCEP



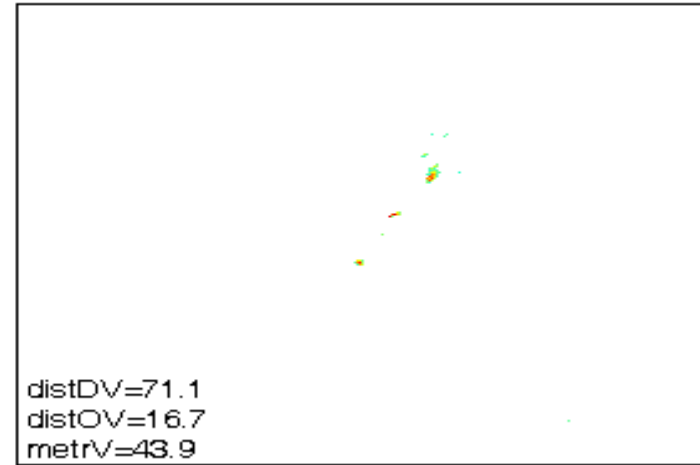
2.4.2 Experiment(2)

Date:20050519 Threshold=75mm

Observed

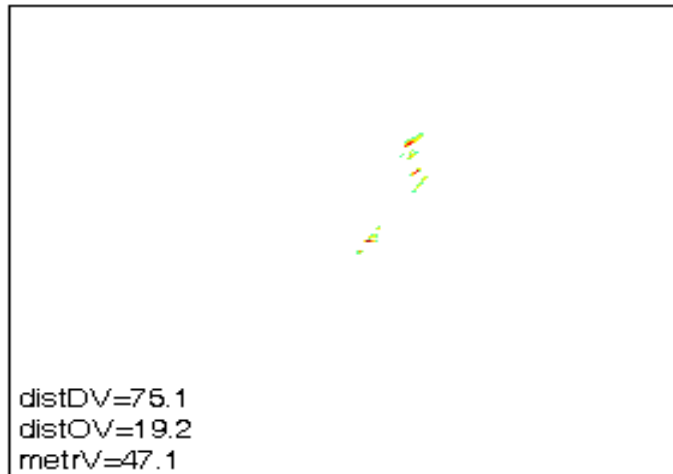


CAPS



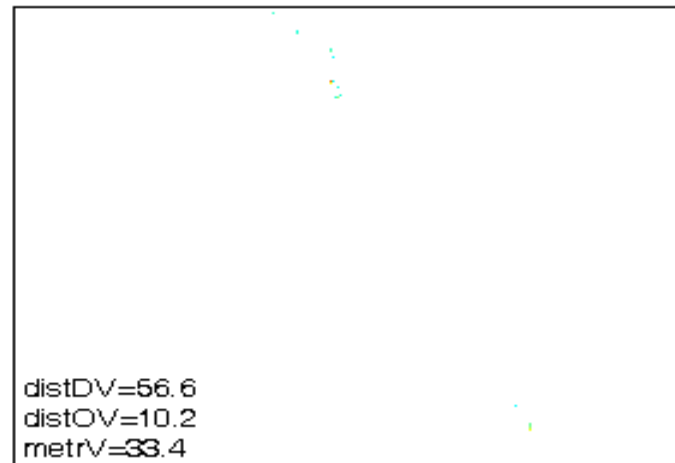
distDV=71.1
distOV=16.7
metrV=43.9

NGAR

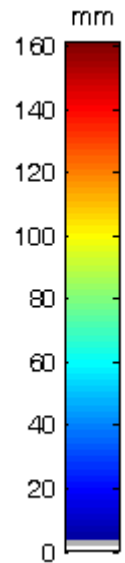


distDV=75.1
distOV=19.2
metrV=47.1

NCEP

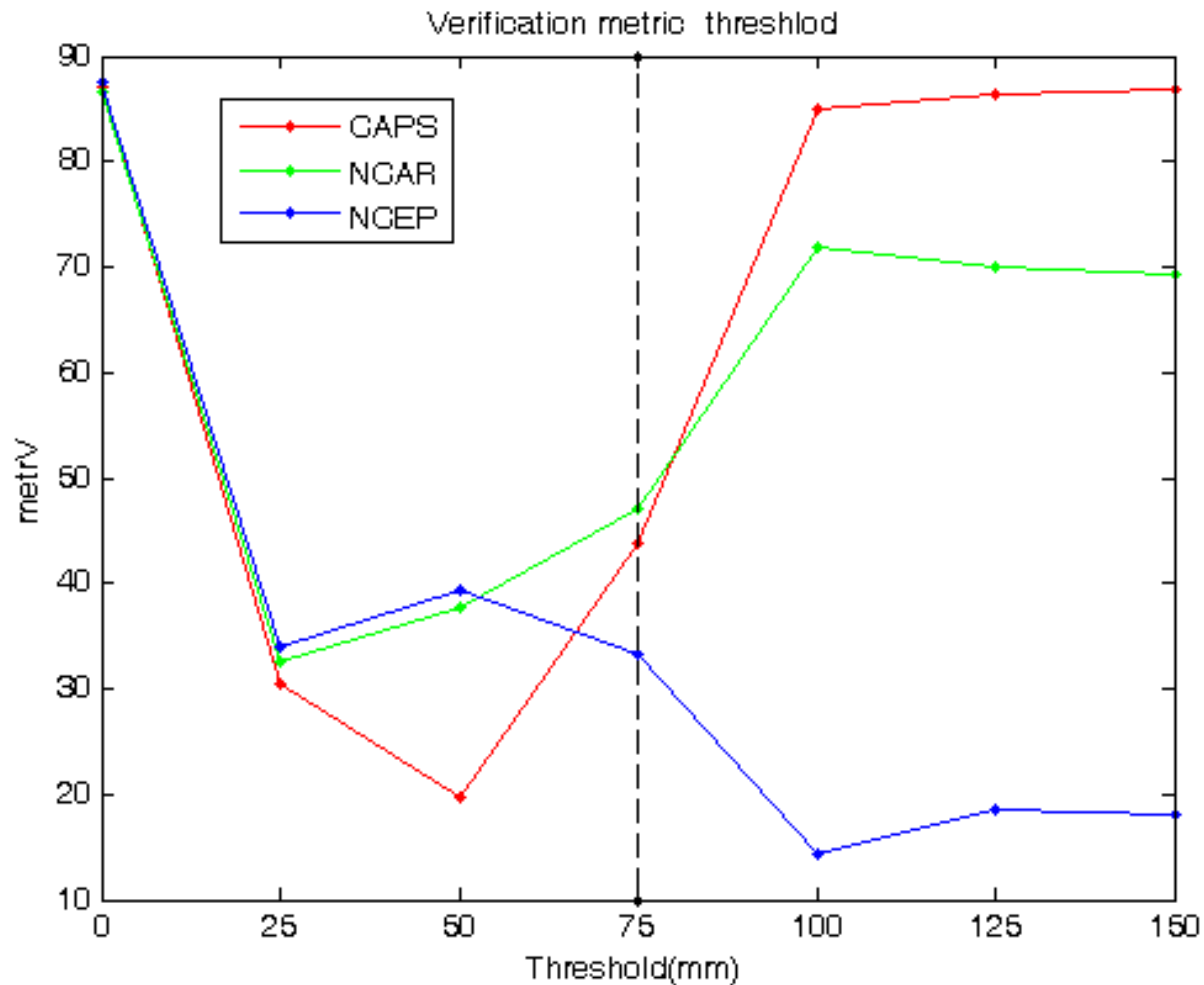


distDV=56.6
distOV=10.2
metrV=33.4



2.4.3 Diagram of distance with respect to precipitations.

Date:20050519



2.5.0 Experiment(5)

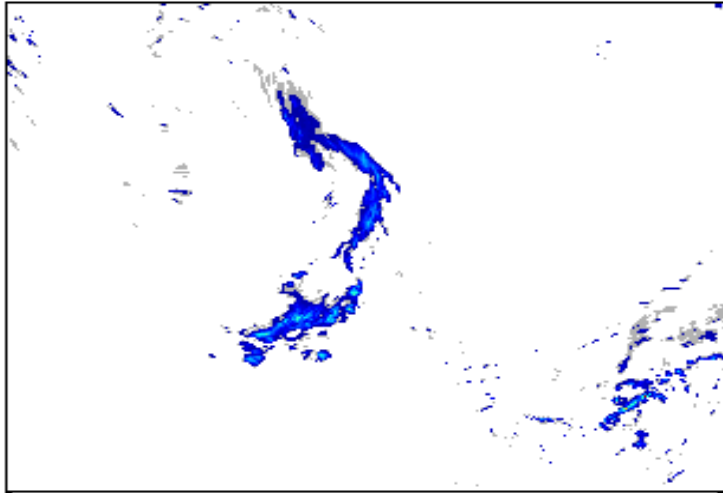
- fake000 (Top left): Original
- fake001 (Top right): 3 pts. Right
- fake002 (2nd row left) : 6 pts. Right
- fake003 (2nd row right): 12 pts. Right
- fake004 (3rd row left) : 24 pts. right
- fake005 (3rd row right): 48 pts. right
- fake006 (Bottom left) : 12 pts. right, 10 pts down
- fake007 (Bottom right) : 12pts. right, 20 pts down, minus 2mm

2.5.1 Experiment(5)

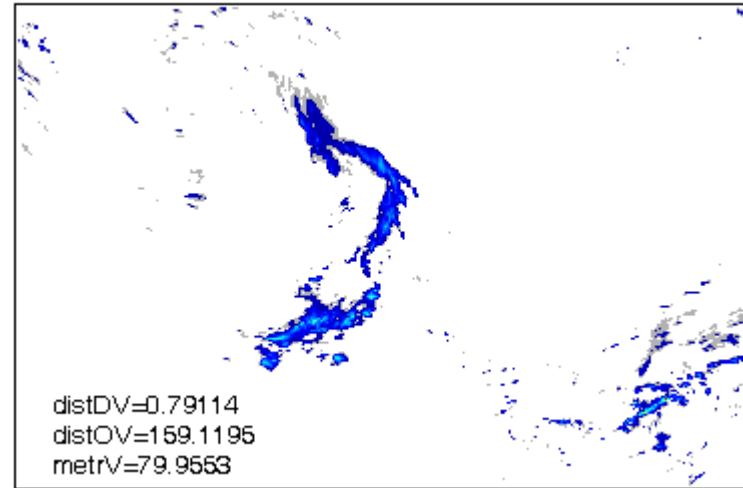
Date : 20050531

Threshold=0mm

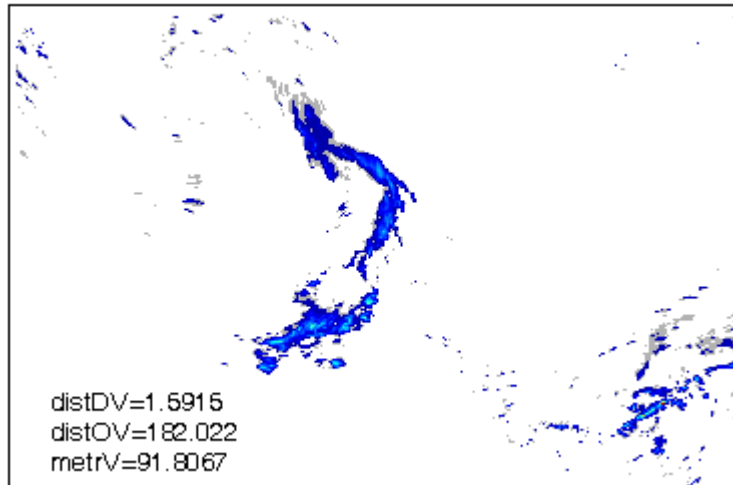
observed



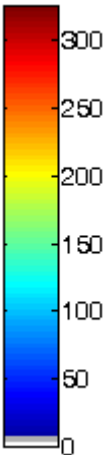
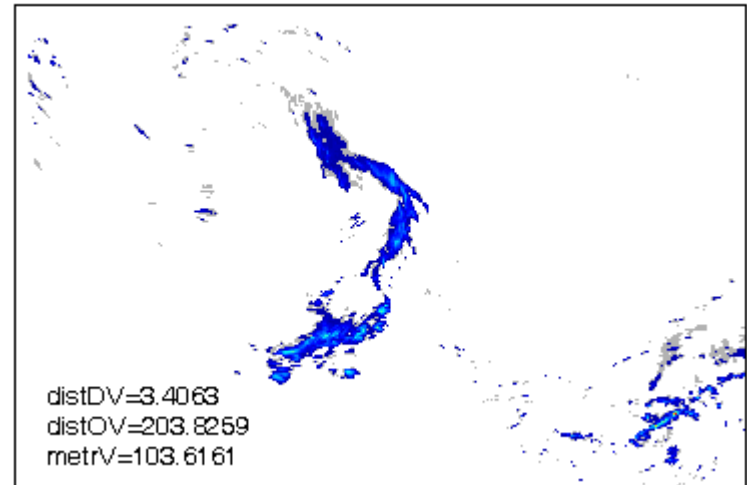
fake001



fake002



fake003

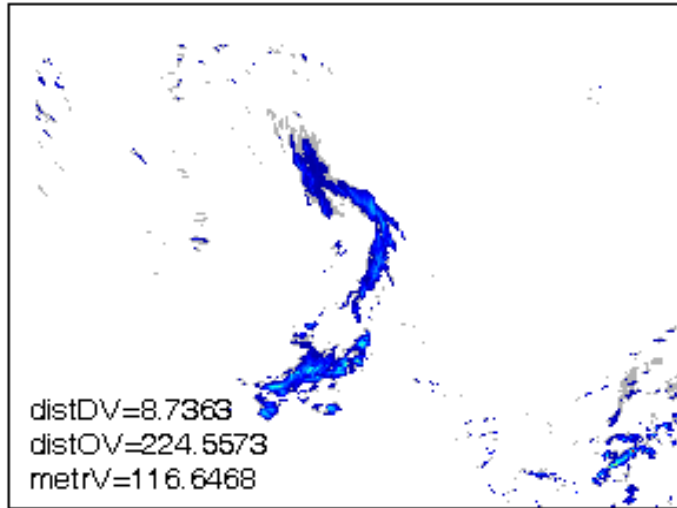


NEED TO DESCRIBE FAKE DATA

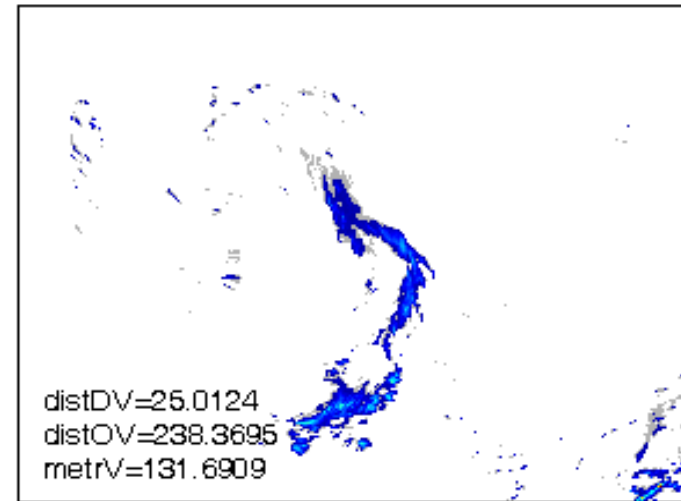
2.5.1 Experiment(5), continuous

Date : 20050531 Threshold=0mm

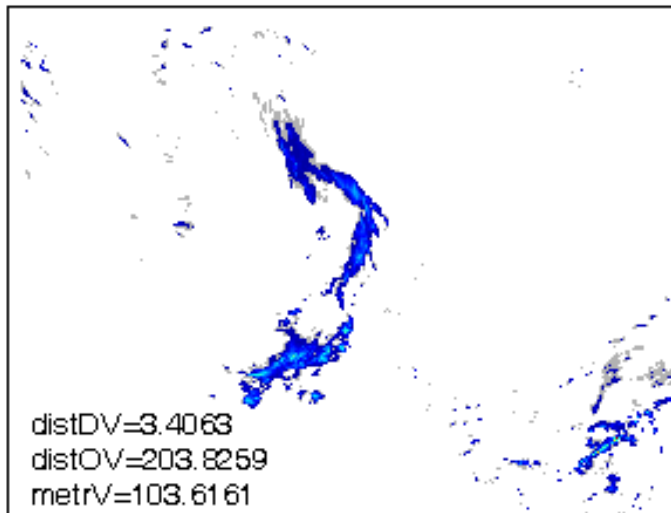
fake004



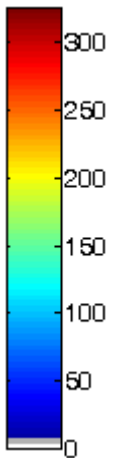
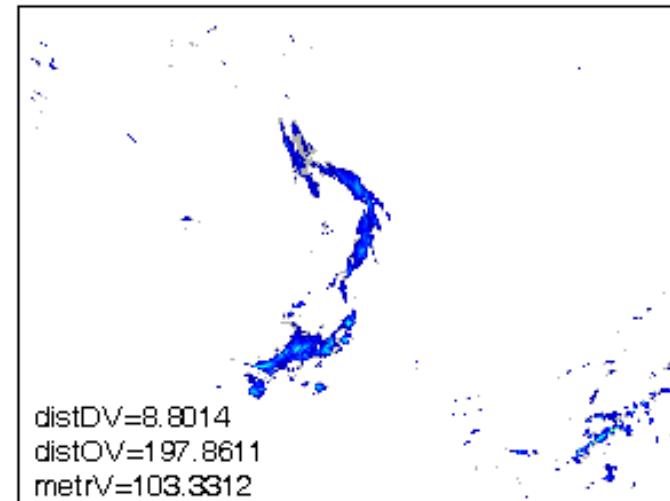
fake005



fake006

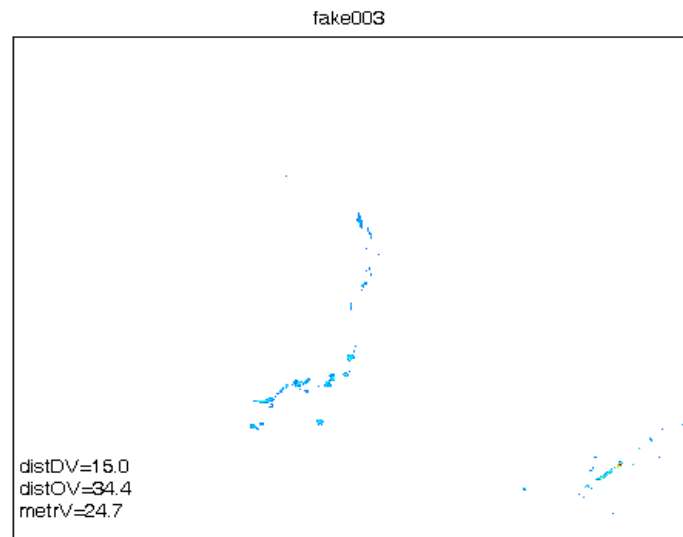
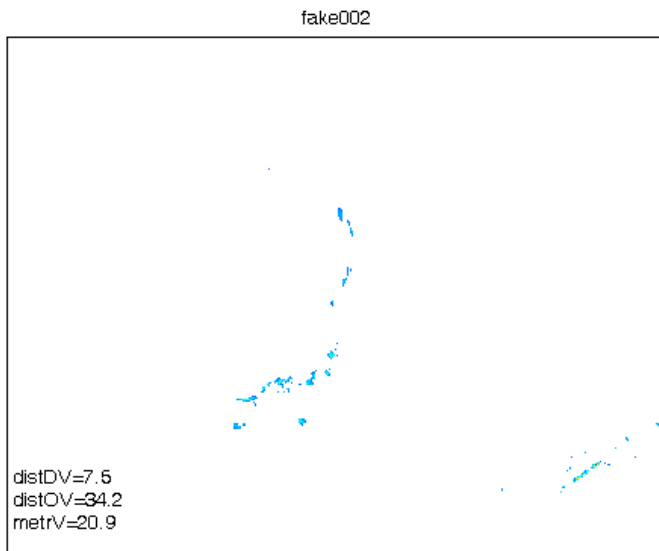
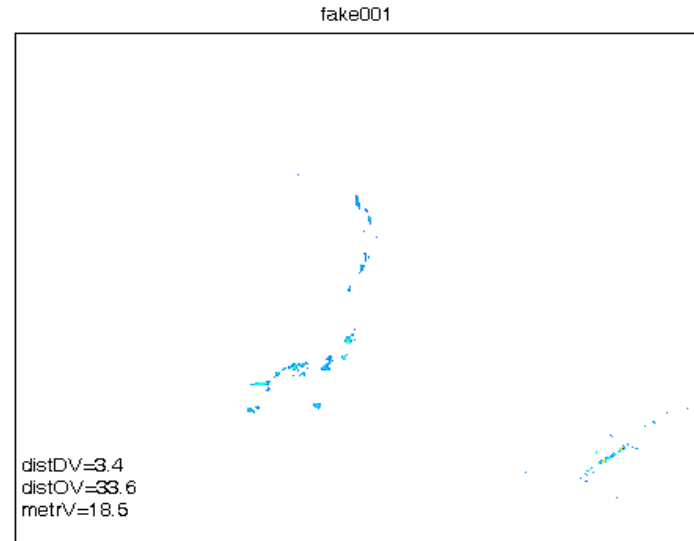
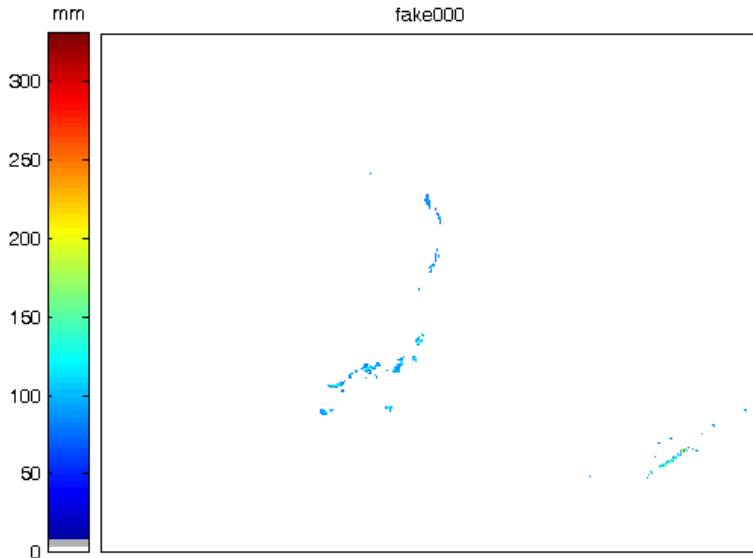


fake007



2.5.2 Experiment(5)

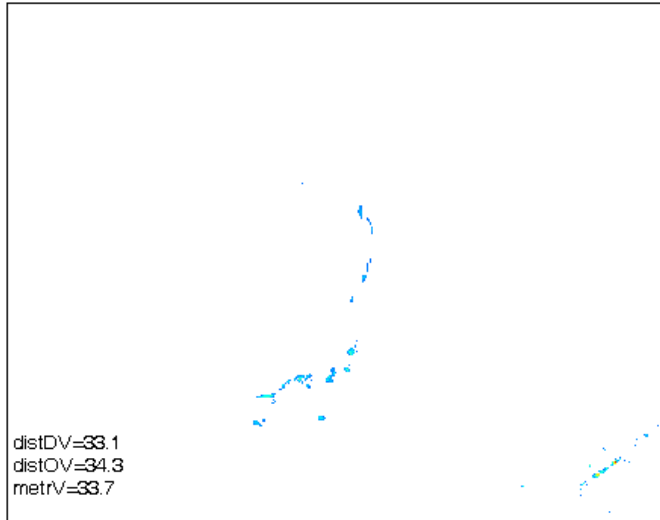
Threshold=75mm



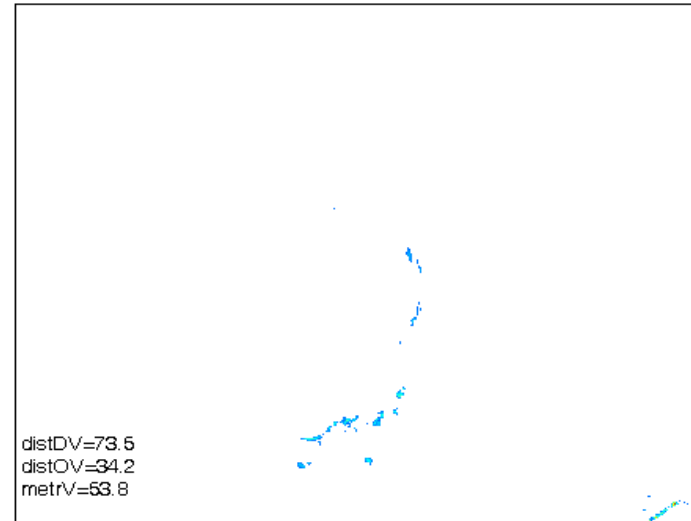
2.5.2 Experiment(5), continuous

Threshold=75mm

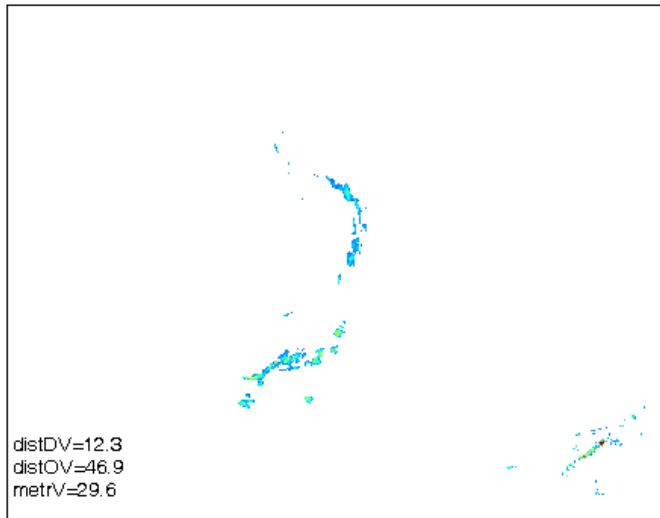
fake004



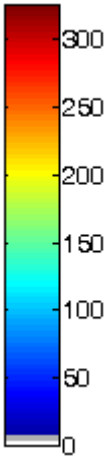
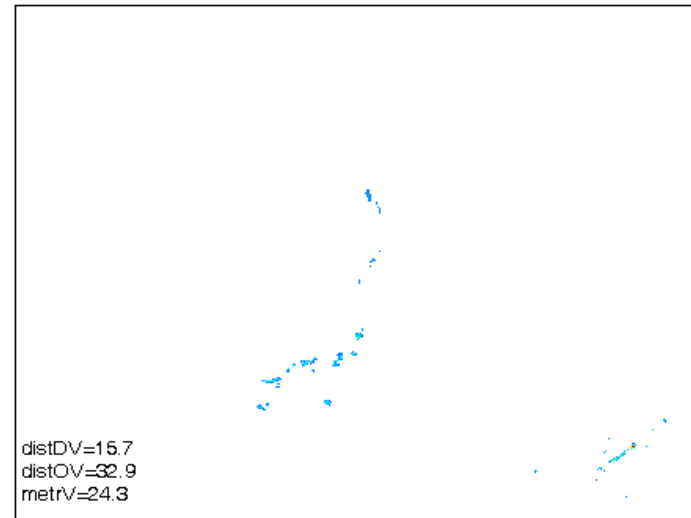
fake005



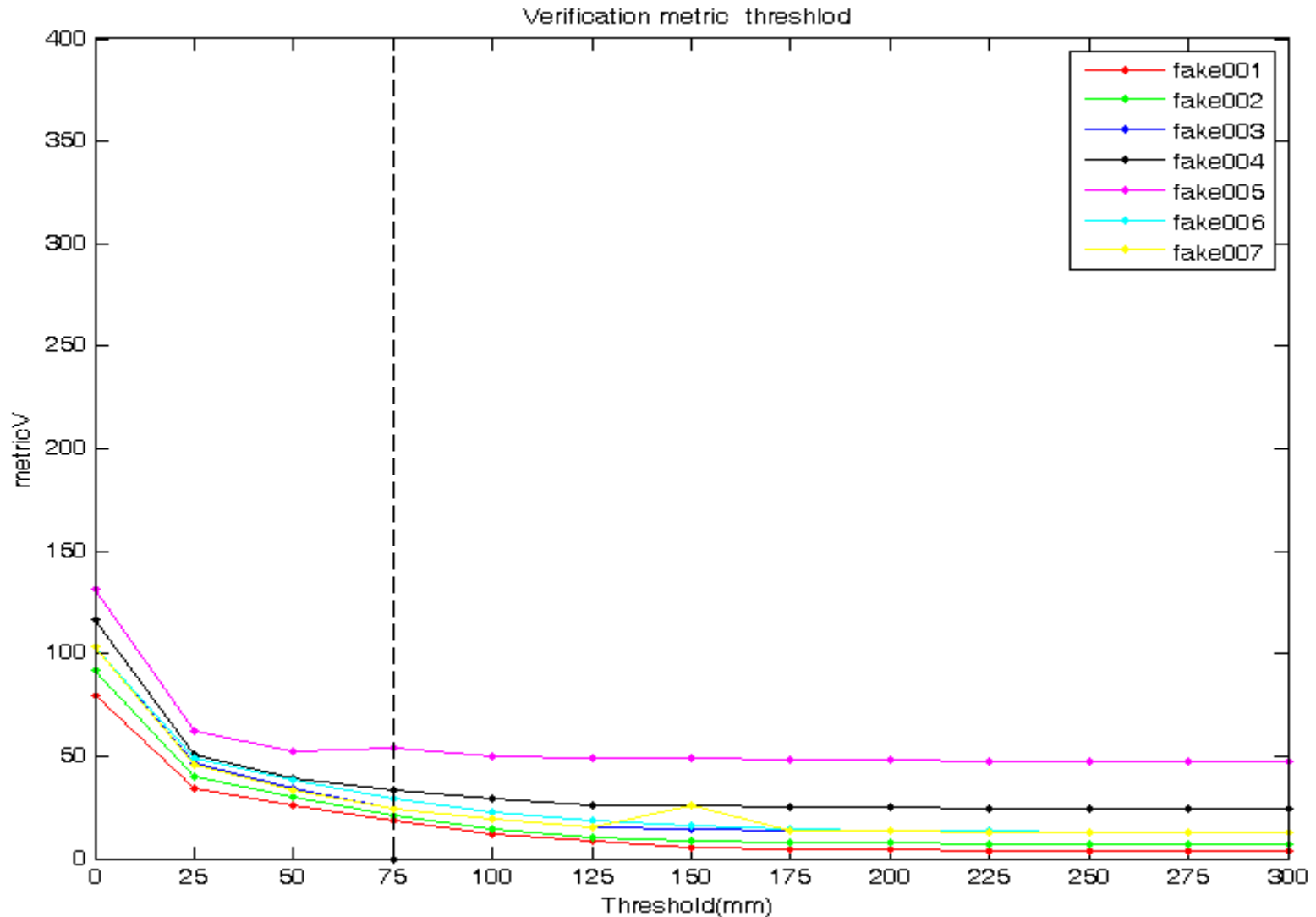
fake006



fake007



2.5.3 Diagram of distance with respect to precipitations.



2.5.4 Distance table.

		0	25	50	75	100	125	150	175	200	225	250	275	300
fake001	distDV	0.7911	1.5492	2.2555	3.4497	4.5123	5.0224	4.9694	5.1678	5.2255	5.4959	5.4959	5.4959	5.4155
	distOV	159.1195	66.1513	49.2341	33.5559	20.0998	12.0830	6.4807	4.6904	4.0000	2.4495	2.4495	2.4495	2.0000
	metrV	79.9553	33.8503	25.7448	18.5028	12.3060	8.5527	5.7251	4.9291	4.6127	3.9727	3.9727	3.9727	3.7077
fake002	distDV	1.5915	3.8472	5.4493	7.4864	9.1510	8.7080	10.7204	10.9102	11.0248	11.2934	11.2934	11.2934	1.5915
	distOV	182.0220	76.7072	54.0000	34.2345	20.0000	12.0000	6.4807	4.6904	4.0000	2.4495	2.4495	2.4495	182.0220
	metrV	91.8067	40.2772	29.7247	20.8605	14.5755	10.3540	8.6006	7.8003	7.5124	6.8715	6.8715	6.8715	91.8067
fake003	distDV	3.4063	9.2223	12.0422	15.0140	18.5809	18.7941	22.3220	22.5003	22.6725	22.9392	22.9392	22.9392	3.4063
	distOV	203.8259	84.4926	56.2761	34.4384	20.0998	12.0830	6.4807	4.6904	4.0000	2.4495	2.4495	2.4495	203.8259
	metrV	103.6161	46.8574	34.1592	24.7262	19.3403	15.4386	14.4014	13.5954	13.3363	12.6944	12.6944	12.6944	103.6161
fake004	distDV	8.7363	16.0773	21.9533	33.0608	38.5062	40.5485	45.5399	45.7907	45.9896	46.2552	46.2552	46.2552	8.7363
	distOV	224.5573	84.6227	55.7584	34.2929	20.0998	12.0830	6.4807	4.6904	4.0000	2.4495	2.4495	2.4495	224.5573
	metrV	116.6468	50.3500	38.8559	33.6768	29.3030	26.3157	26.0103	25.2405	24.9948	24.3523	24.3523	24.3523	116.6468

2.5.4 Distance table, continuous

		0	25	50	75	100	125	150	175	200	225	250	275	300
fake005	distDV	25.0124	38.5404	49.4368	73.4571	79.6974	86.0717	91.8764	92.2380	92.4518	92.8989	92.8989	92.8989	25.0124
	distOV	238.3695	86.0988	55.9911	34.2199	19.9750	12.0830	6.4807	4.6904	4.0000	2.4495	2.4495	2.4495	238.3695
	metrV	131.6909	62.3196	52.7139	53.8385	49.8362	49.0774	49.1786	48.4642	48.2259	47.6742	47.6742	47.6742	131.6909
fake006	distDV	3.4063	7.5496	9.8439	12.3402	13.9522	15.0664	17.2711	19.0329	19.2444	21.5609	22.1030	22.4174	3.4063
	distOV	203.8259	90.8515	66.3023	46.8508	32.0312	22.3830	14.9332	10.4881	7.5498	4.8990	3.8730	3.6056	203.8259
	metrV	103.6161	49.2006	38.0731	29.5955	22.9917	18.7247	16.1021	14.7605	13.3971	13.2300	12.9880	13.0115	103.6161
fake007	distDV	8.8014	9.7908	12.4251	15.7159	19.1530	19.4990	45.8865	22.5003	22.9474	22.9392	22.9392	22.9392	8.8014
	distOV	197.8611	81.3572	54.0185	32.9090	18.9209	11.1803	6.0000	4.6904	3.8730	2.4495	2.4495	2.4495	197.8611
	metrV	103.3312	45.5740	33.2218	24.3124	19.0369	15.3397	25.9432	13.5954	13.4102	12.6944	12.6944	12.6944	103.3312

THANK YOU