

## Estimation of Sustainable Safe yield of Wells using analytical and numerical models in Northern Wadi Araba Basin, Southern Jordan

### *Analisi comparativa della variabilità della temperatura dell'acqua su scale temporali da orarie ad annuali in due grandi sorgenti carsiche nel carso dinarico*

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### Supplementary file - *File supplementare*

#### Analysis of Recovery Tests

The water levels in the pumping and monitoring wells steadily rise after the pump is turned off at the end of a pumping test. This test is known as a recovery test, where the drawdown measurements below the initial static water level during the recovery period are referred to as residual drawdown.

From a practical point of view, it is necessary to measure the residual drawdown which enables the estimation of transmissivity and therefore, provides an independent check on the results of pumping tests.

When the construction of monitoring wells is not possible, another important application of the recovery test is to determine transmissivity by measuring the recovery in the pumping well itself. Since the pump does not influence the water in the well during the recovery period, more accurate data can be obtained compared to the pumping period.

Theis's recovery equation was used to analyse the recovery tests of the drilled wells, and the results were described in Table 3.

Tab. 3 - Interpretation of Hydraulic Parameter from Aquifer Tests.

Well No.	Aquifer type	Type of test	Transmissivity (m <sup>2</sup> /d)	Storativity
WMD-1	Neuman (1975) unconfined Theis (1935)	Pumping test	1.07	1.38x10 <sup>-2</sup>
		Recovery test	1.14	
WMSH-1	Neuman (1975) unconfined Theis (1935)	Pumping test	18.59	3.98x10 <sup>-2</sup>
		Recovery test	22.35	
WMSH-2	Neuman (1975) unconfined Theis (1935)	Pumping test	10.81	3.16x10 <sup>-2</sup>
		Recovery test	13.15	
WMSH-3	Neuman (1975) unconfined Theis (1935)	Pumping test	9.77	2.09x10 <sup>-2</sup>
		Recovery test	6.89	
WMSH-4	Neuman (1975) unconfined Theis (1935)	Pumping test	55.39	6.79x10 <sup>-1</sup>
		Recovery test	64.53	
WMSH-5	Neuman (1975) unconfined Theis (1935)	Pumping test	1.15	7.31x10 <sup>-3</sup>
		Recovery test	1.83	
WMSH-6	Neuman (1975) unconfined Theis (1935)	Pumping test	1.58	2.54x10 <sup>-3</sup>
		Recovery test	0.88	
QSSH-1	Neuman (1975) unconfined Theis (1935)	Pumping test	1.4	5.86x10 <sup>-3</sup>
		Recovery test	1.1	

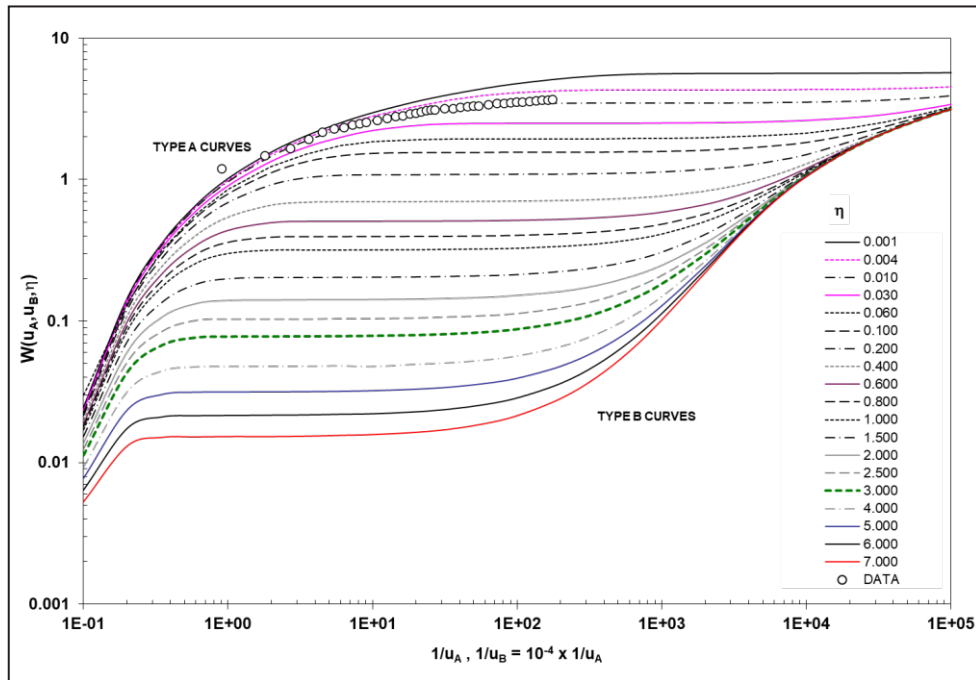
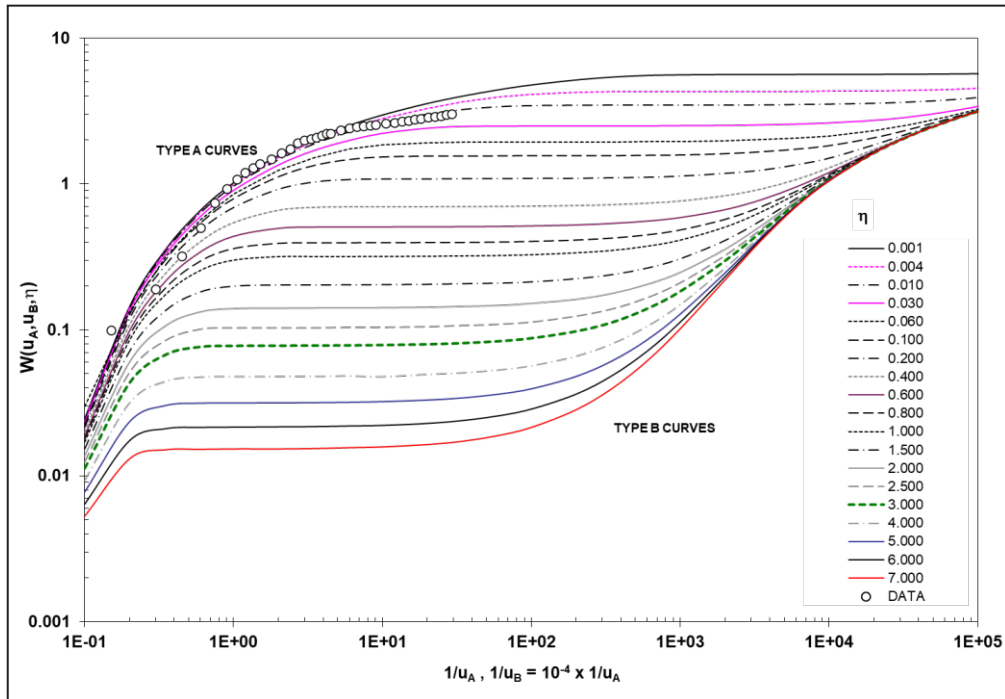


Figure (7): Neuman Time-Drawdown data of WMSH-1 well

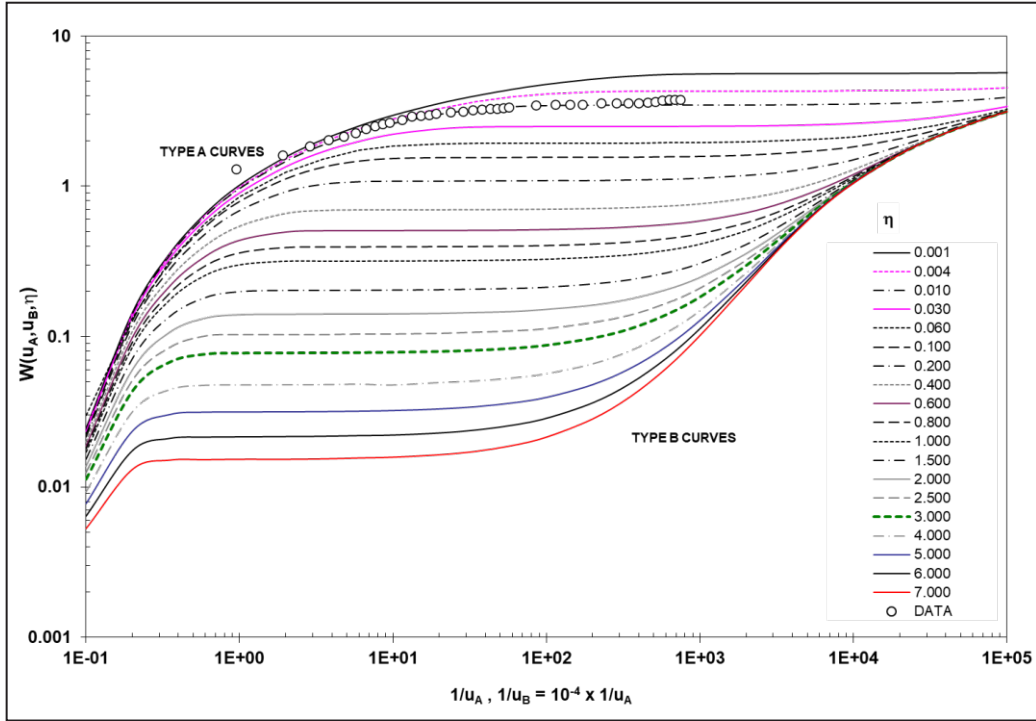


Figure (8): Neuman Time-Drawdown data of WMSH-2

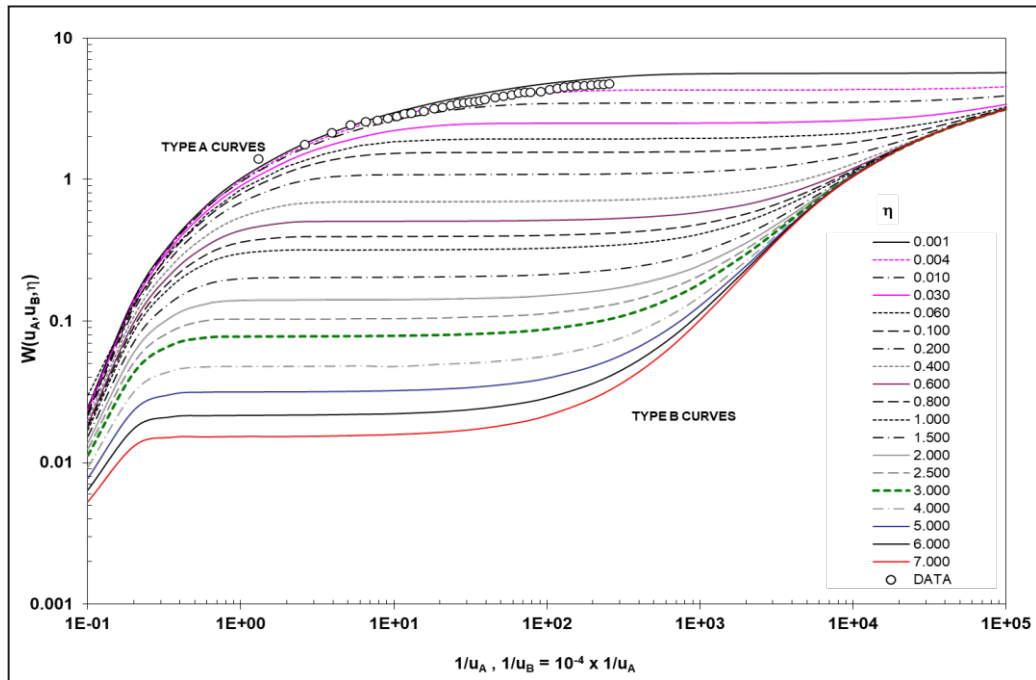


Figure (9): Neuman Time-Drawdown data of WMSH-3 Well

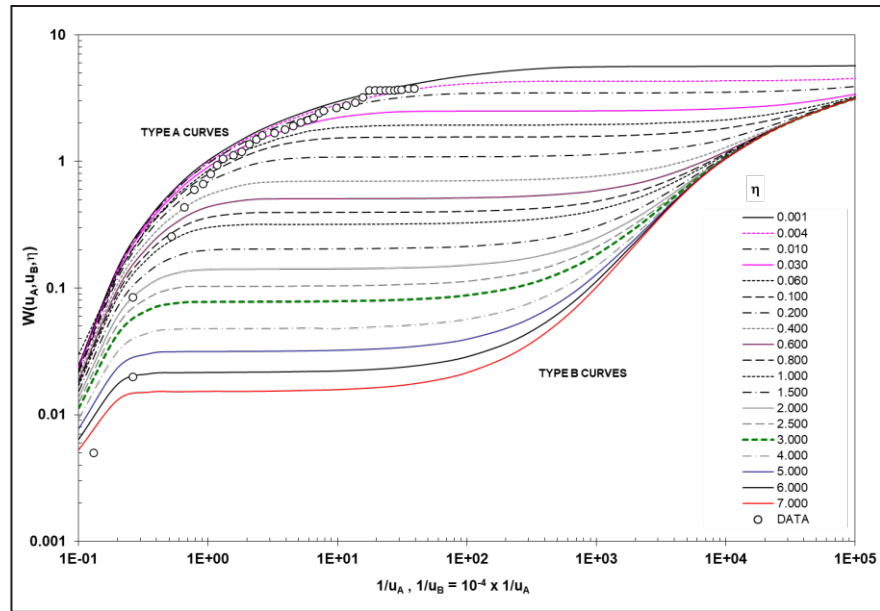


Figure (10): Neuman Time-Drawdown test data of WMSH-4 Well

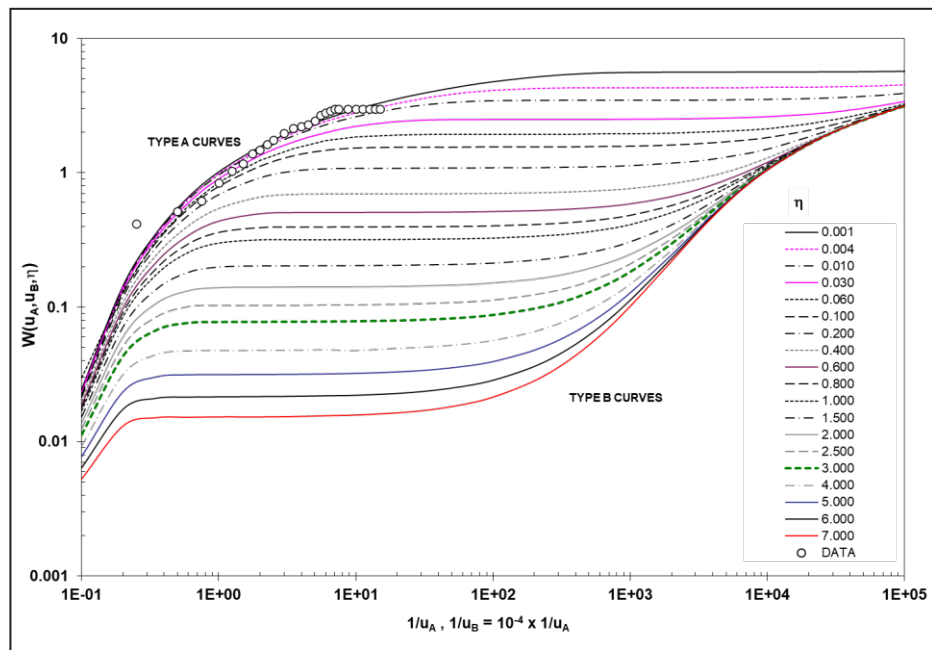
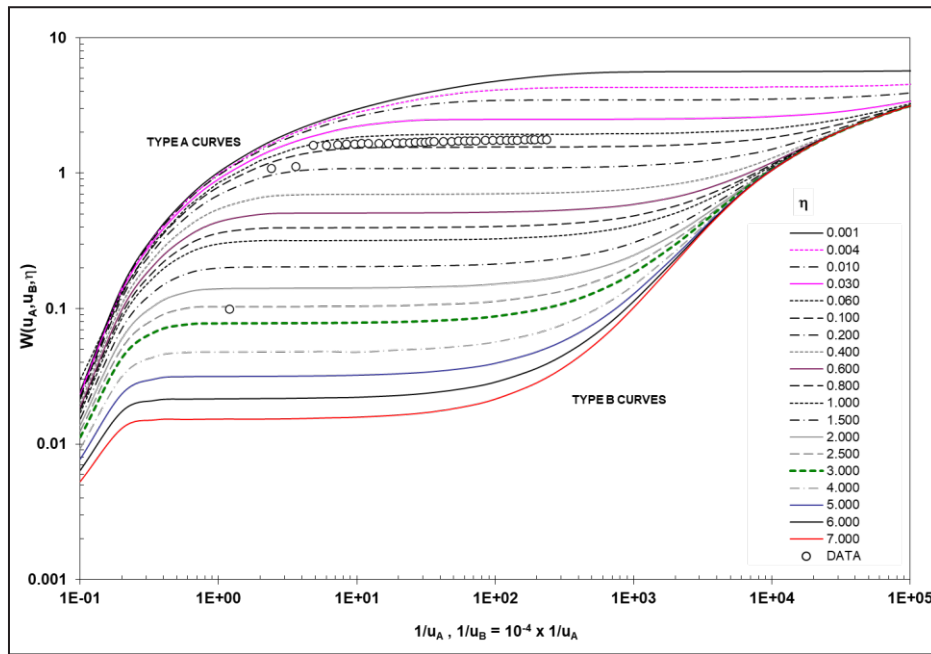
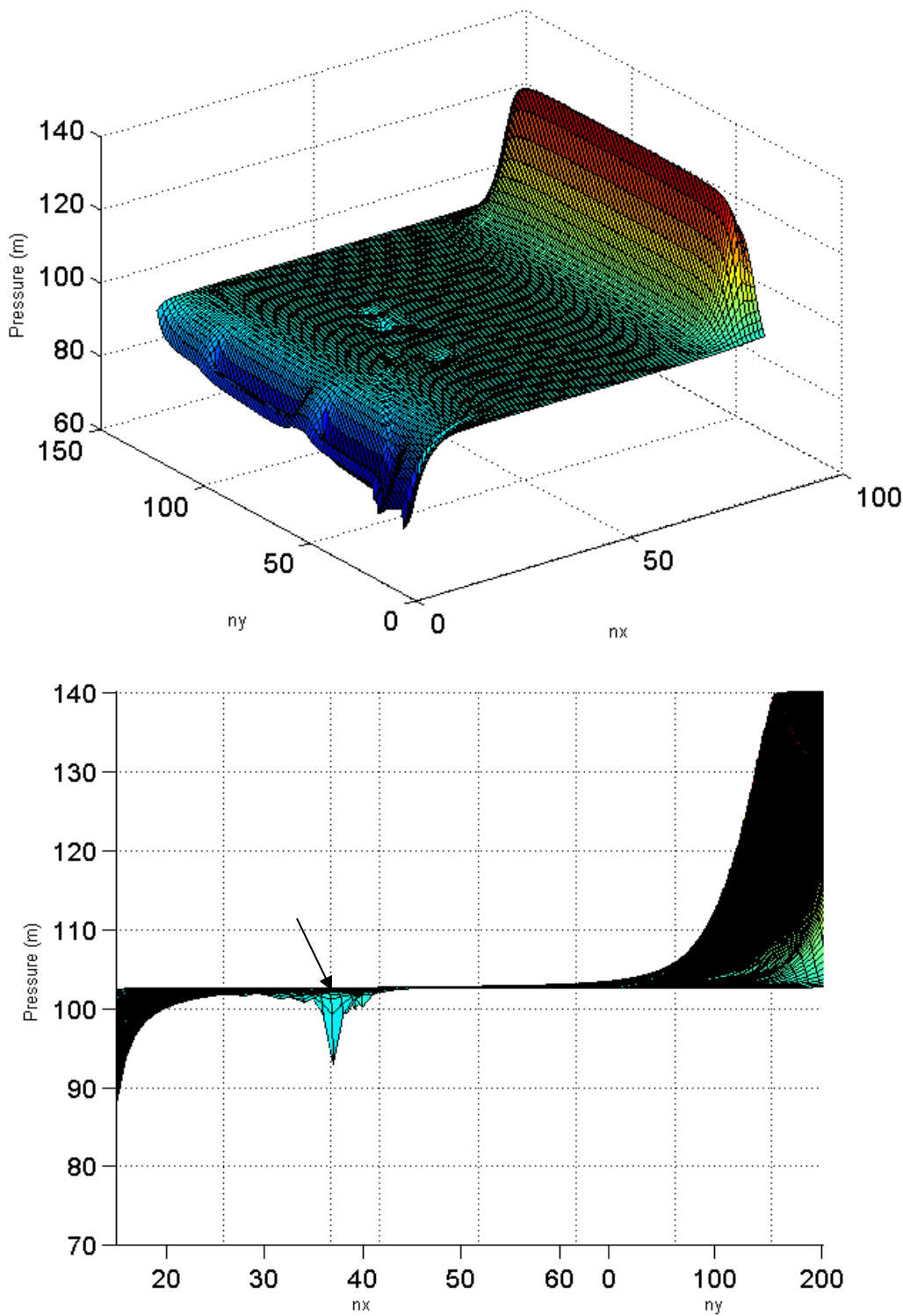


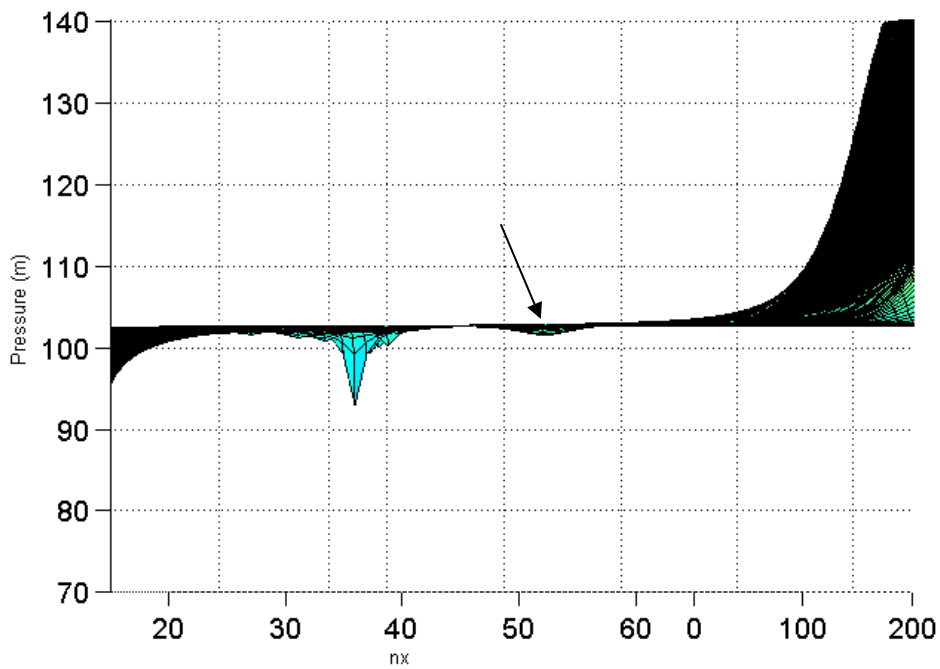
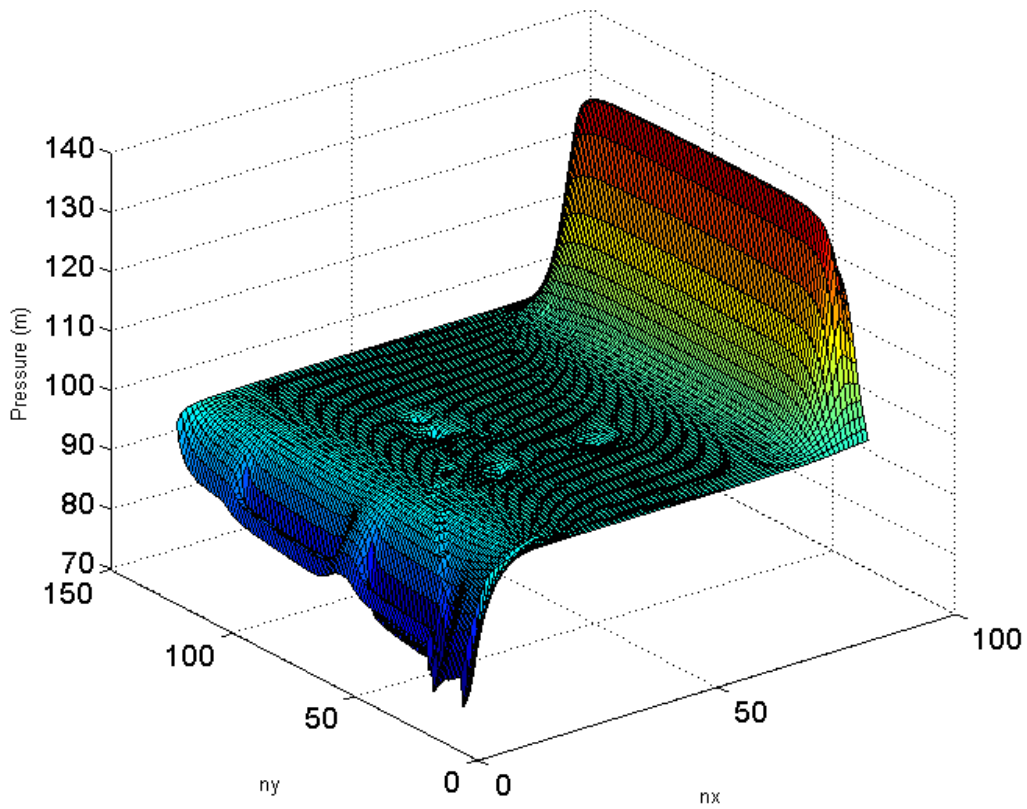
Figure (11): Neuman Time-Drawdown data of WMSH-5 Well



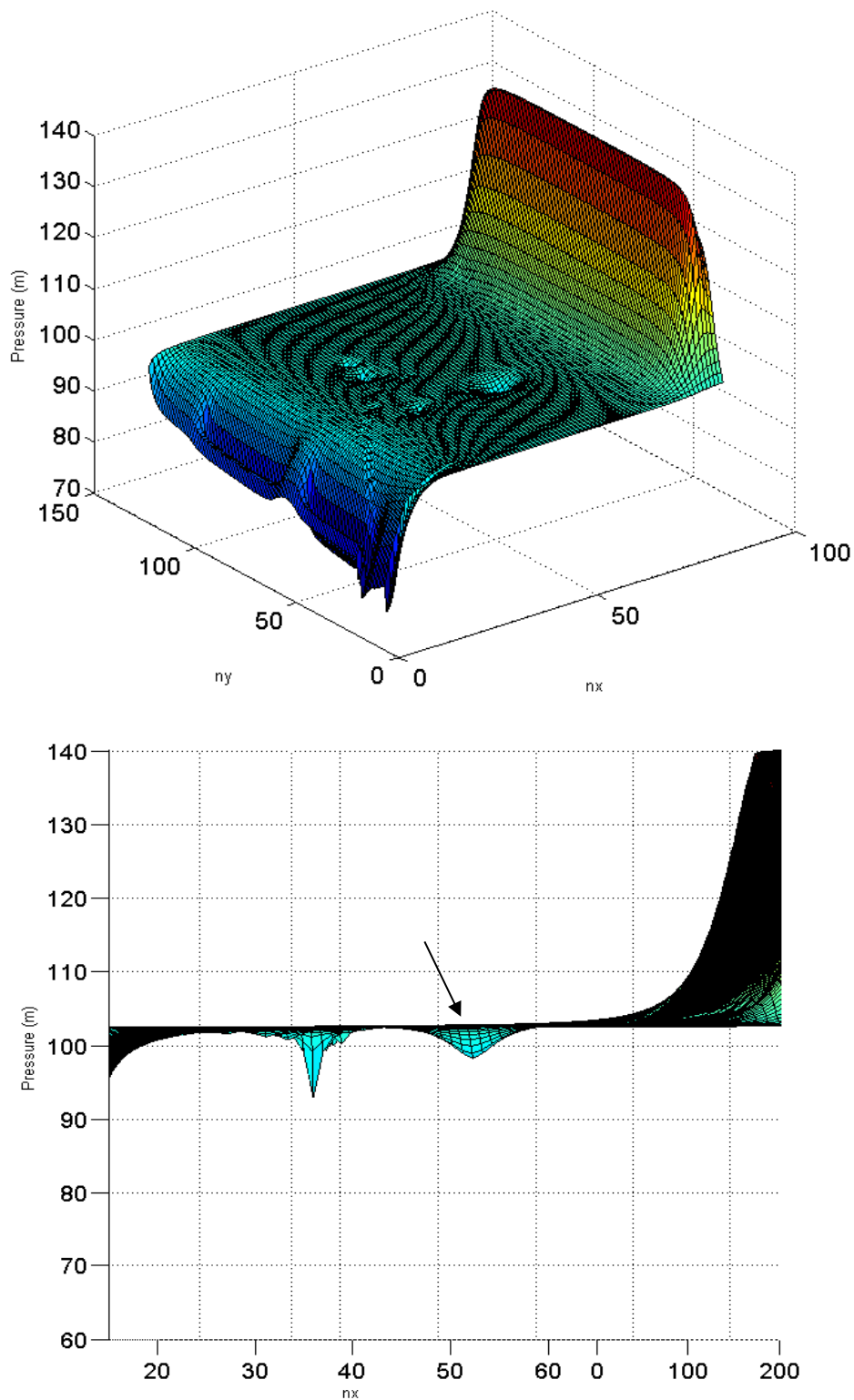
**Figure (12):** Neuman Time-Drawdown data of WMSH-6



**Figure (17):** Pressure Field at Z=1000m (PF grid) showing cones of depression from pumping wells for calibrated run (Pumping from Beer Mathkor Wells = zero).



**Figure (18):** Pressure Field at Z=1000m (PF grid) showing cones of depression from pumping wells for scenario sc4 in Table 6 (Pumping from Beer Mathkor Wells = 1500 m<sup>3</sup>/day).



**Figure (19):** Pressure Field at Z=1000m (PF grid) showing cones of depression from pumping wells for scenario sc6 in Table 6 (Pumping from Beer Mathkor Wells = 5000 m<sup>3</sup>/day).