ĶSTANBUL TEKNĶK ÜNĶVERSĶTESĶ FEN BĶLĶMLERĶ ENSTĶTÜSÜ

# ÇOK BĶRĶMLĶ BĶR BĶNANIN DOĴAL HAVALANDIRMA DAVRANIĶININ SAYISAL ANALĶZĶ

**YÜKSEK LĶSANS TEZĶ**

**Osman AVCI**

**Makina Mühendisliği Anabilim Dalı**

**Isı Akıkan Programı**

**OCAK 2014**

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**(503101120)**

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İTÜ, Fen Bilimleri Enstitüsü'nün 503101120 numaralı Yüksek Lisans öğrencisi **Osman AVCI**, ilgili yönetmeliklerin belirlediği gerekli tüm şartları yerine getirdikten sonra hazırladığı **"ÇOK BĶRĶMLĶ BĶR BĶNANIN DOĴAL HAVALANDIRMA DAVRANIŞININ SAYISAL ANALĶZĶ"** başlıklı tezini aşağıda imzaları olan jüri önünde başarı ile sunmuştur.

| | | |
|---|---|---|
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**Savunma Tarihi :** **24 Ocak 2014**

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4.2.8 % L Q D P R G H O + 0 L o L Q ... D Q D O L ] ... V R Q X o O U Õ
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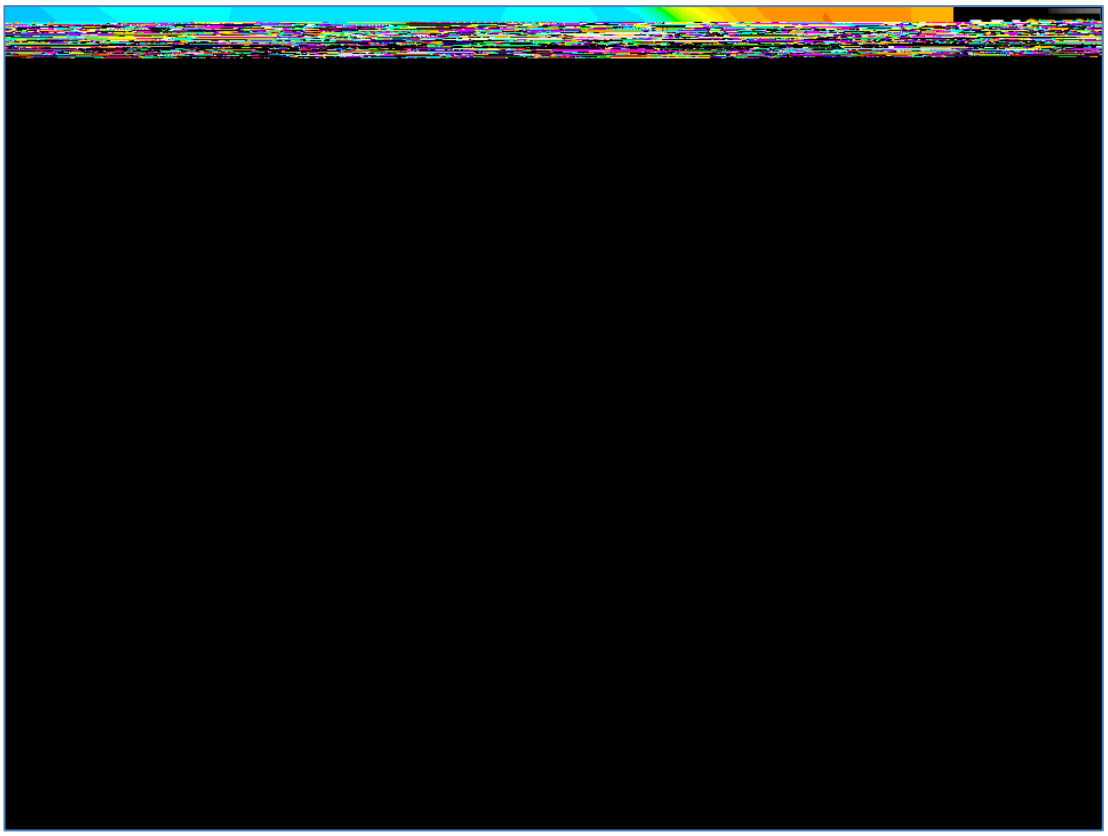
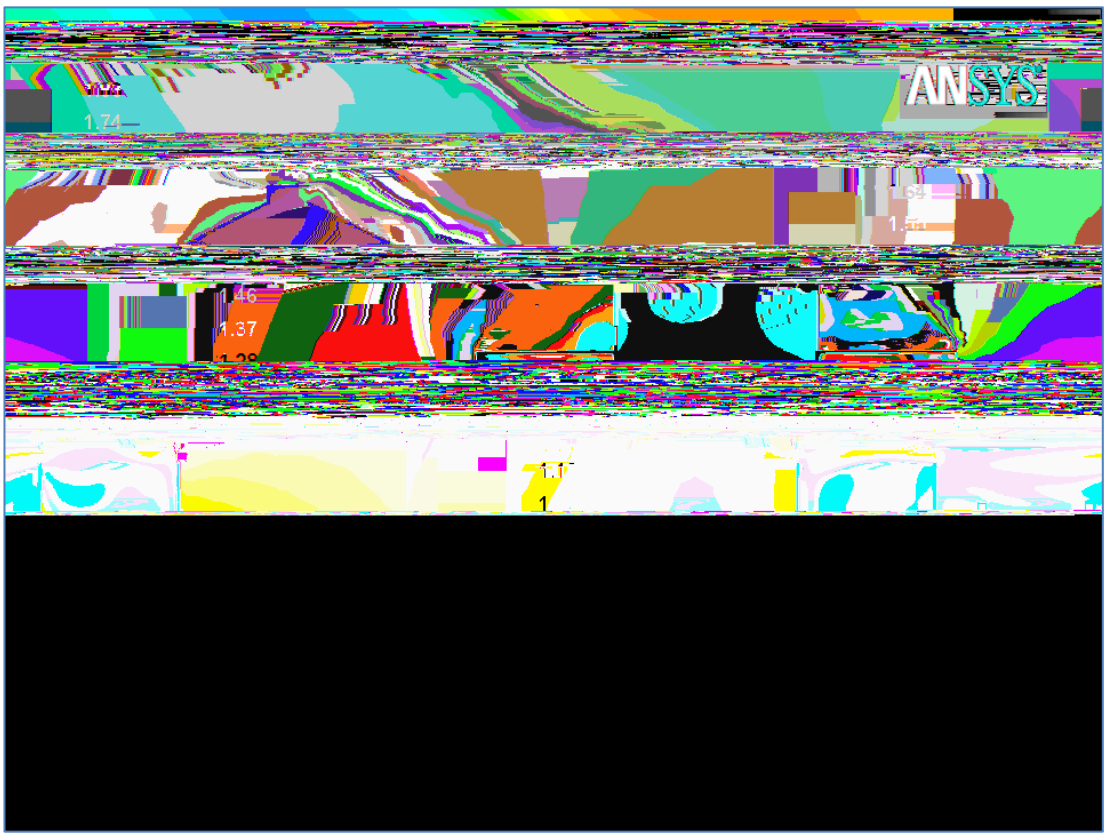


ù H N 5.8O Model HM2, D2 G ] O H P L Q G H N L K Õ] G D ÷ÕO ÕP ÕQ ÕQ N R Q W X U




ù H N 5.9O Model HM2, D4 G ] O H P L Q G H N L K Õ] G D ÷ÕO ÕP ÕQ ÕQ N R Q W X U

dL]H4O18H Bina model HM LoLQ EDFD DoÕNOÕNODUÕQGDQ JLUHQ YH oÕNDQ KDYDQÕQ

| 5 ]JL<br><|Q | 5 ]JL<br>+Õ]Ç<br>(m/sn) | %DFDGD %XOXQDQ $oÕNOÕNODUGD<br>%DFD $oÇ<br>7DUDIÕ | +Õ] P VQ |
|---|---|---|---|
| Kuzey | 1,5 | Kuzey - 6D÷ | 0,62 |
| | | *QH-\Sol | 0,00 |
| Toplam | | | 0,31 |

dL]H4O19:H Bina model HM LoLQ NX]H\ FHSKHVLQGHNL SHQFHUHOHUGHQ JLUHQ YH oÕNDQ

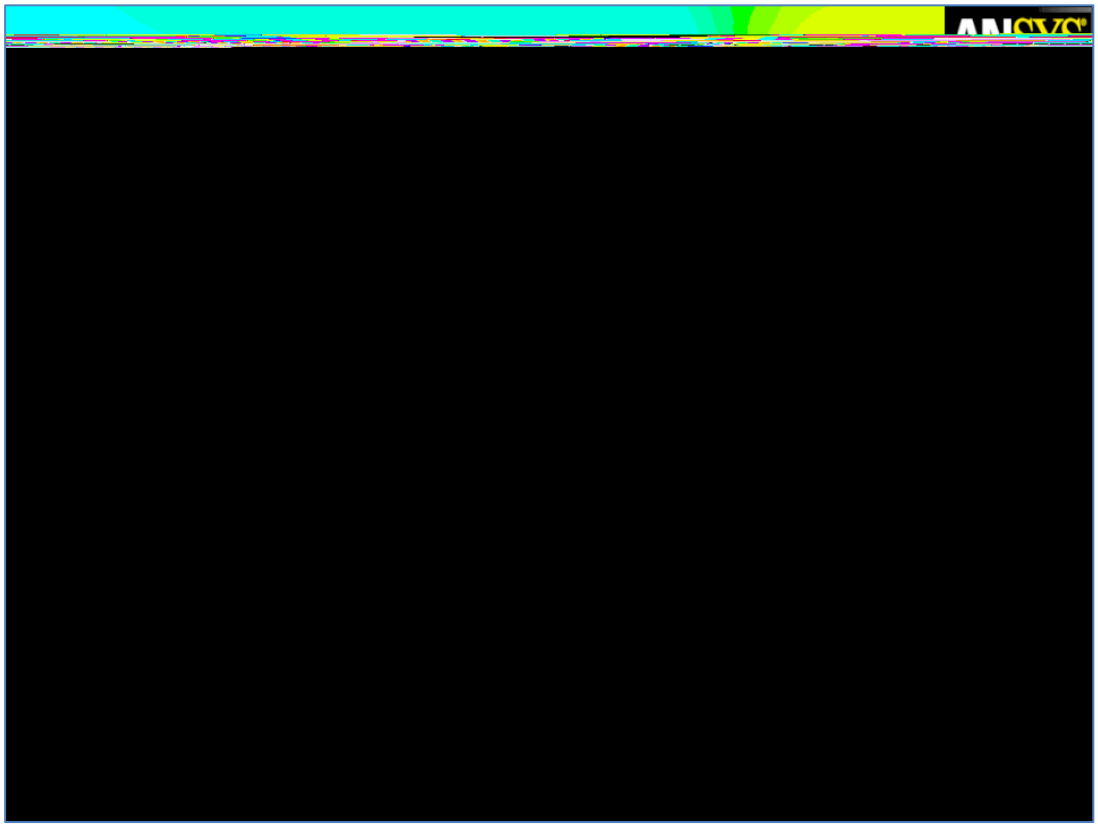
| Bina Kuzey Cephesindeki 3HQFHUHOHULQGHNL +Õ] ’H÷HU | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kat 1 | +Õ] P V | Kat 2 | +Õ] P V | Kat 3 | +Õ] P V | Kat 4 | +Õ] P V |
| udf1r1 | 0,83 | udf2r1 | 0,79 | udf3r1 | 0,73 | udf4r1 | 0,49 |
| udf1r2 | 1,00 | udf2r2 | 0,95 | udf3r2 | 0,84 | udf4r2 | 0,60 |
| udf1r3 | 1,02 | udf2r3 | 0,96 | udf3r3 | 0,85 | udf4r3 | 0,60 |
| udf1r4 | 0,88 | udf2r4 | 0,83 | udf3r4 | 0,75 | udf4r4 | 0,51 |
| uwf1r1 | 0,97 | uwf2r1 | 0,94 | uwf3r1 | 0,95 | uwf4r1 | 1,07 |
| uwf1r2 | 0,83 | uwf2r2 | 0,83 | | | | |

d L ] H 4 0 2 0 H Bina model HM L o L Q J Q H \ F H S K H V L Q G H N L S H Q F H U H O H U G H Q J L U H Q Y H o Õ N D

| | % L Q D * Q H \ & H S K H V L Q G H N L 3 H Q F H U H O H U L Q G | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Kat 1 | + Õ] P V | Kat 2 | + Õ] P V | Kat 3 | + Õ] P V | Kat 4 | + Õ] P V | |
| udf1l1 | 0,46 | udf2l1 | 0,55 | udf3l1 | 0,58 | udf4l1 | 0,59 | |
| udf1l2 | 0,53 | udf2l2 | 0,56 | udf3l2 | 0,54 | udf4l2 | 0,54 | |
| udf1l3 | 0,63 | udf2l3 | 0,44 | udf3l3 | 0,45 | udf4l3 | 0,46 | |
| udf1l4 | 0,29 | udf2l4 | 0,35 | udf3l4 | 0,38 | udf4l4 | 0,46 | |
| uwf1l1 | 0,38 | uwf2l1 | 0,40 | uwf3l1 | 0,48 | uwf4l1 | 0,49 | |
| uwf1l2 | 0,41 | uwf2l2 | 0,38 | uwf3l2 | 0,41 | uwf4l2 | 0,44 | |
| uwf1l3 | 0,46 | uwf2l3 | 0,31 | uwf3l3 | 0,33 | | | |



ù H M4.63O 0RGHO +0 LGLQH PLQGHNLDVÕQÕQ



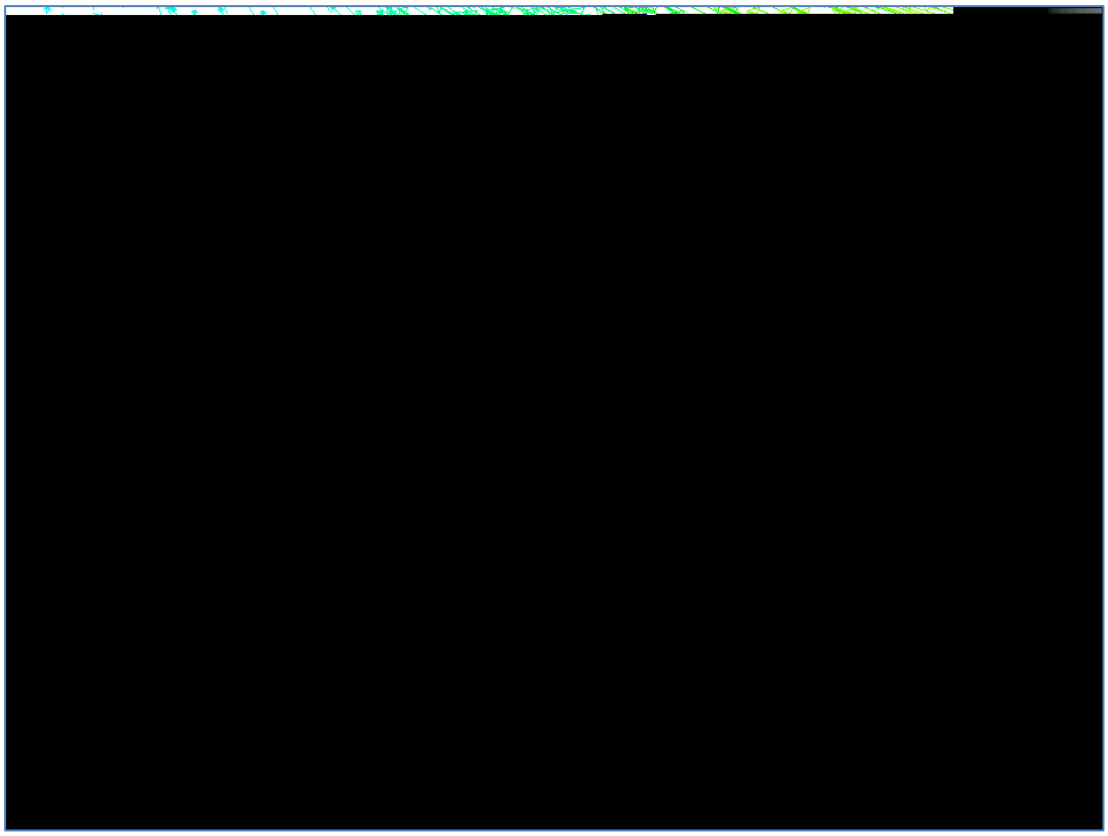
ù H M4.64O Model HM2, < G ]OHPLQGHNLÕQÕQ NRQWXU RODUDN J|VWHULPL



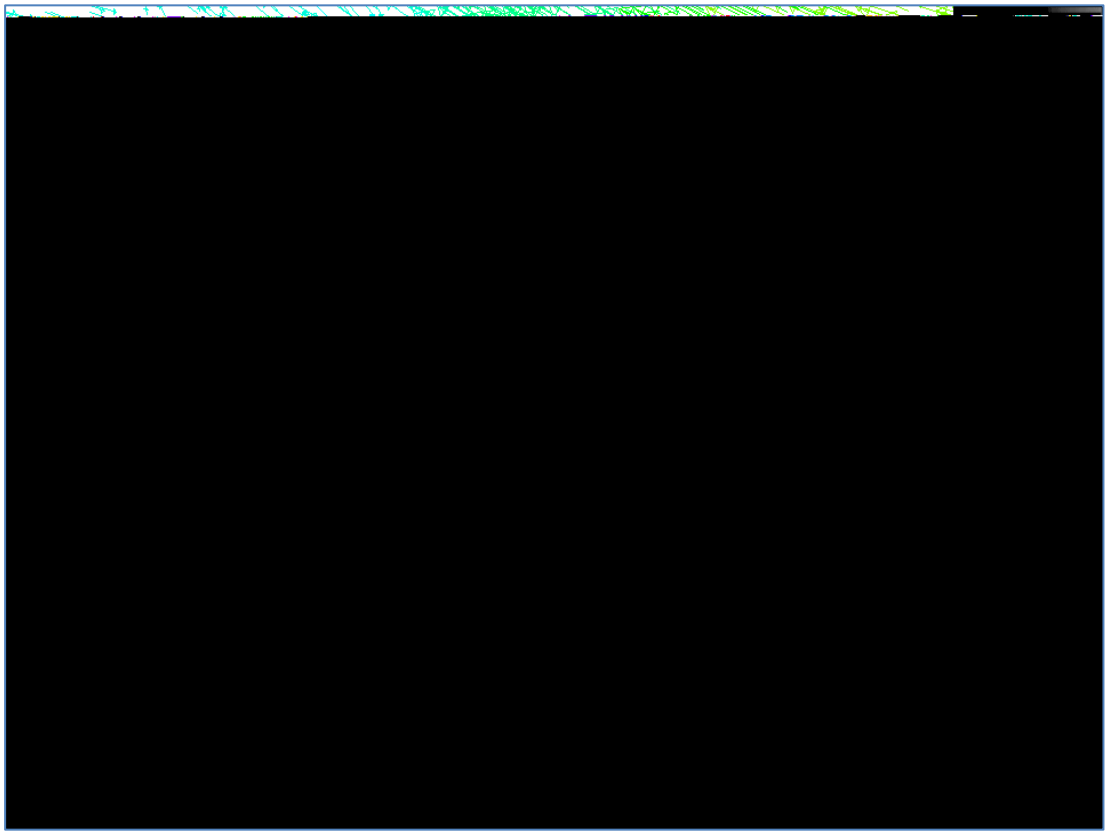

ù H M4.65O Model HM2, < G ] O H P LEQDGVHÕQLÕO ÕP ÕQ ÕQ N R Q W X U R O D U D
J | V W H U L P L



ù H M4.66O 0 R G H O + 0 ’ L GL ]O H P L Q G H NELD Y EQoWÕUPÕO

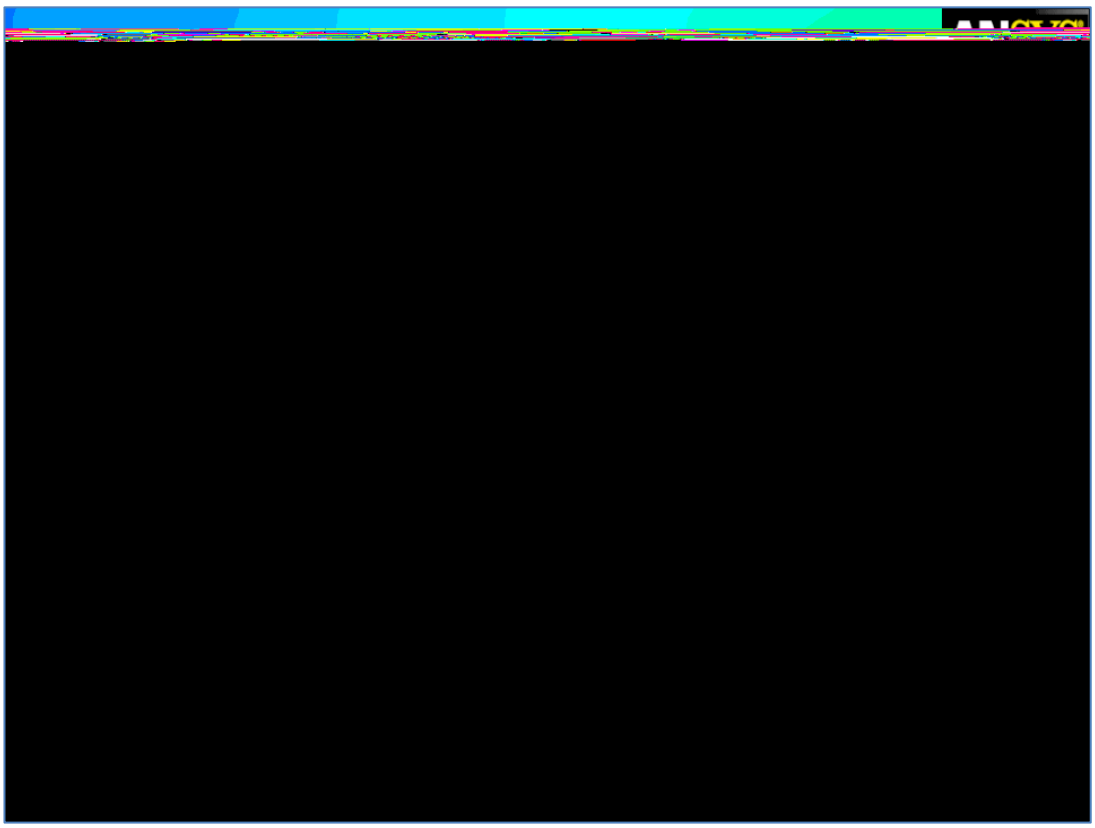


ù H M 4.67 O 0 R G H O + 0 D 2 L G L ] Q O H P L Q G H N E L D Y Y ê Q o w Q U Õ P I Õ

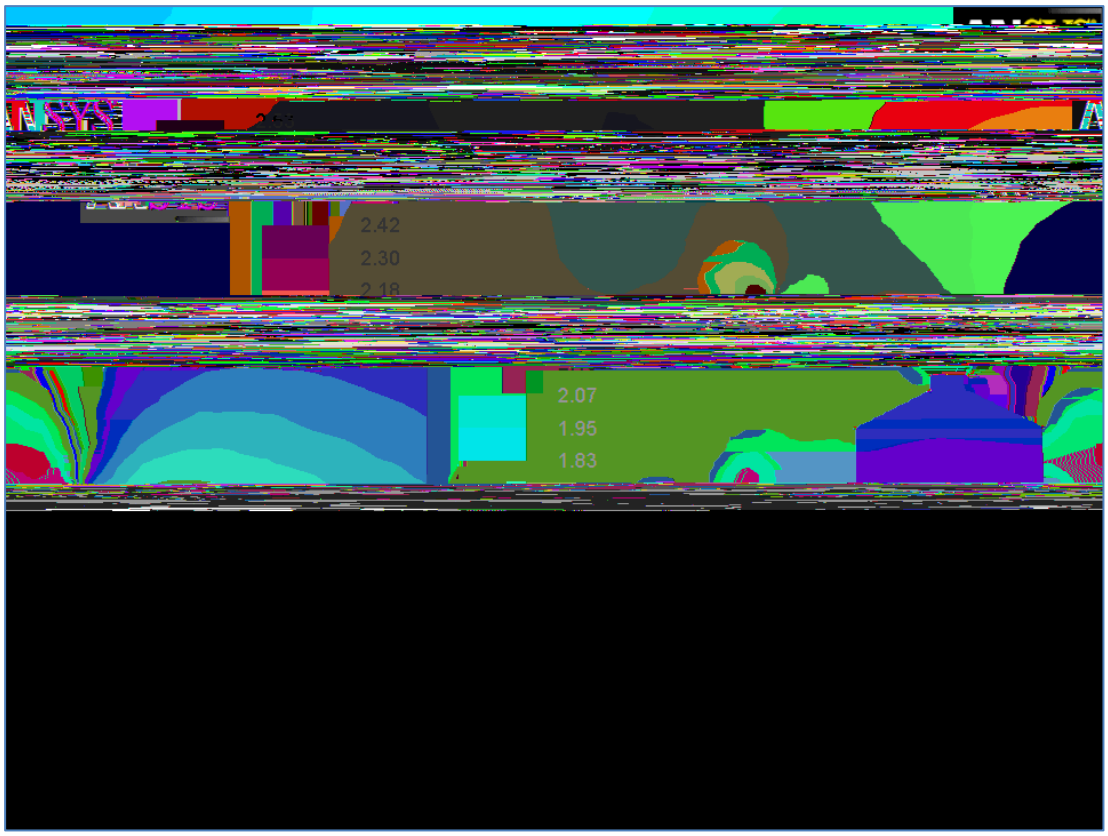


ù H M 4.68 O 0 R G H O + 0 L G L ] Q O H P L Q G H N E L D Y Y ê Q o w Q U Õ P I Õ

ù H M4.69O 0 R G H O + 0 L 6L ]Q H P L Q G H NLD Y Ø Q W Õ U Õ P Õ



ù H M4.70O Model HM2, ’ G ] O H P L Ł Q G W Õ Q ÷ Õ O Õ P Õ Q Õ Q N R Q W X U R O D U D
J | V W H U L P L




ù H M4.Z1O Model HM2, D4 G ] O H P L H Q D Y Q Õ Q Õ Q N R Q W X U R O D U D N J | V W H U L P L

d L ] H 4 O 2 1 H Bina model HM2 L o L Q E D F D D o Õ N O Õ N O D U Õ Q G D N L E D V Õ Q o

| 5 ] J D < \| Q | 5 ] J L + Õ ] Õ (m/sn) | % D F D G D % X O X Q D Q % $ o Õ 7 D U D I Õ | P (pascal) |
|---|---|---|---|
| Kuzey | 1,5 | Kuzey - 6 D ÷ * Q H \ Sol | 1,02<br>0,69 |
| Ortalama | | | 0,85 |

dL]H4022HBina model HM2 LoLQ NX]H\ FHSKHVLQGHNL SHQFHUHOHUGHNL EDVÕQo C

| %LQD .X]H\ &HSKHVLQGHNL 3HQFHUHOHULQG | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kat 1 | P (pascal) | Kat 2 | P (pascal) | Kat 3 | P (pascal) | Kat 4 | P (pascal) |
| udf1r1 | 1,24 | udf2r1 | 1,34 | | | | |

4.2.7.3 Bina modeli HM LoLQ N•WOH GHQJHVL

%LQD PRGHOL ]HULQGH EXOXQDQ DoÕNGDÕNODUÕQ GDÕOÕP SHQF
EDKVHGLOPLœWL $QDOL] LoLQ WDQÕPODQDQ DoÕNOÕNODUG
JLUHQÕYHQoKDYD PLNWDUOYHUÕOLJHOHUL dL]HOJHOHU¶H
YHULOPLœWLU

d|] POHULQ NDUDUOÕKDOH JHOGL÷LQL J|UHEHVLPHN LoLQ RGD
EDNÕOPÕœWÕU NÕVPÕQGDNL DoÕNOÕNODUGDNL kseDYD PLNWDU
EDFDQÕQ VRO WDUDIÕQGDNL KDYDODQGÕUDQ ÕNOÕ÷ÕQÕQ NDS
PLNWDUÕQGDQ GDKD ID]OD KDYDQÕQ EDFDG¶GÜ ELQD\Õ W
DQODPVÕOPDGÕ|HOHPH |QFHOLNOH KDYDQÕQ LON RODUDN Lo
ceph HVLQGH \DSÕOPÕœWÕU verilerinde ]HKLUOL
EXOXQDQ RILVOHUGHNL SHQFHUHOHUGH NL OHEHWLOL ÷HUÇHO
verilerinde LVH JHQHOHS\KHVLQH DLW GHEL GH÷HUOHUL D\UÕQWÕOÕRO
FHSKHVLQGHNL SHQFHUHOHU HQ X]DN E|OJHGH ROGXNODUÕQ
NDUDUOÕKDOH JHOPHVL GL÷HU WDUDID J|UH X]XQ V UHFHNW

dL]HOJHOHU Bina modeli HM2 LoLQ EDFDGDQ JLUHQ YH oÕNDQ KDYD PL

| 5 ]JL<br><\|Q | 5 ]JL+ÕÇ (m/sn) | %DFDGD %XOXQDQ $oÕNOÕNODUGDI<br>%DFD $oÃ 7DUDIÕ | Debi (kg/s) |
|---|---|---|---|

d L ] H 4 0 2 5 H Bina model HM L o L Q N X ] H \ F H S K H V L Q G H N L S H Q F H U H O H U G H Q J L U H Q Y H o Õ

| 5 ] J D U < \ Q | 5 ] J D U + Õ Õ (m/sn) | % L Q D . X ] H \ & H S K H V L Q G H N L 3 H Q F H U H O H U L Q ( | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Kat 1 | Debi (kg/s) | Kat 2 | Debi (kg/s) | Kat 3 | Debi (kg/s) | Kat 4 | Debi (kg/s) |
| KUZEY | 1,5 | udf1r1 | -0,85 | udf2r1 | -0,86 | udf3r1 | -0,86 | udf4r1 | -0,79 |
| | | udf1r2 | -1,01 | udf2r2 | -0,98 | udf3r2 | -0,93 | udf4r2 | -0,76 |
| | | udf1r3 | -1,01 | udf2r3 | -0,98 | udf3r3 | -0,92 | udf4r3 | -0,77 |
| | | udf1r4 | -0,84 | udf2r4 | -0,86 | udf3r4 | -0,86 | udf4r4 | -0,78 |
| | | uwf1r1 | 0,85 | uwf2r1 | 0,86 | uwf3r1 | 0,86 | uwf4r1 | 0,79 |
| | | uwf1r2 | 1,01 | uwf2r2 | 0,98 | uwf3r2 | 0,93 | uwf4r2 | |

d L ] H 4 0 2 6 H Bina model HM L o L Q J Q H \ F H S K H V L Q G H N L S H Q F H U H O H U G H Q J L U H Q Y H o Õ N

| 5 ] J D Ul < \ Q | 5 ] J D Ul + Õ ] Õ (m/sn) | %LQD * QH\ &HSKHVLQGHNL 3HQFHUHOHULQ( | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Kat 1 | Debi (kg/s) | Kat 2 | Debi (kg/s) | Kat 3 | Debi (kg/s) | Kat 4 | Debi (kg/s) |
| KUZEY | 1,5 | udf1l1 | 0,68 | udf2l1 | 0,61 | udf3l1 | 0,63 | udf4l1 | 0,55 |
| | | udf1l2 | 0,71 | udf2l2 | 0,59 | udf3l2 | 0,54 | udf4l2 | 0,56 |
| | | udf1l3 | 0,72 | udf2l3 | 0,59 | udf3l3 | 0,52 | udf4l3 | 0,56 |
| | | udf1l4 | 0,68 | udf2l4 | 0,59 | udf3l4 | 0,63 | udf4l4 | 0,55 |
| | | uwf1l1 | -0,68 | uwf2l1 | -0,61 | uwf3l1 | -0,63 | | |

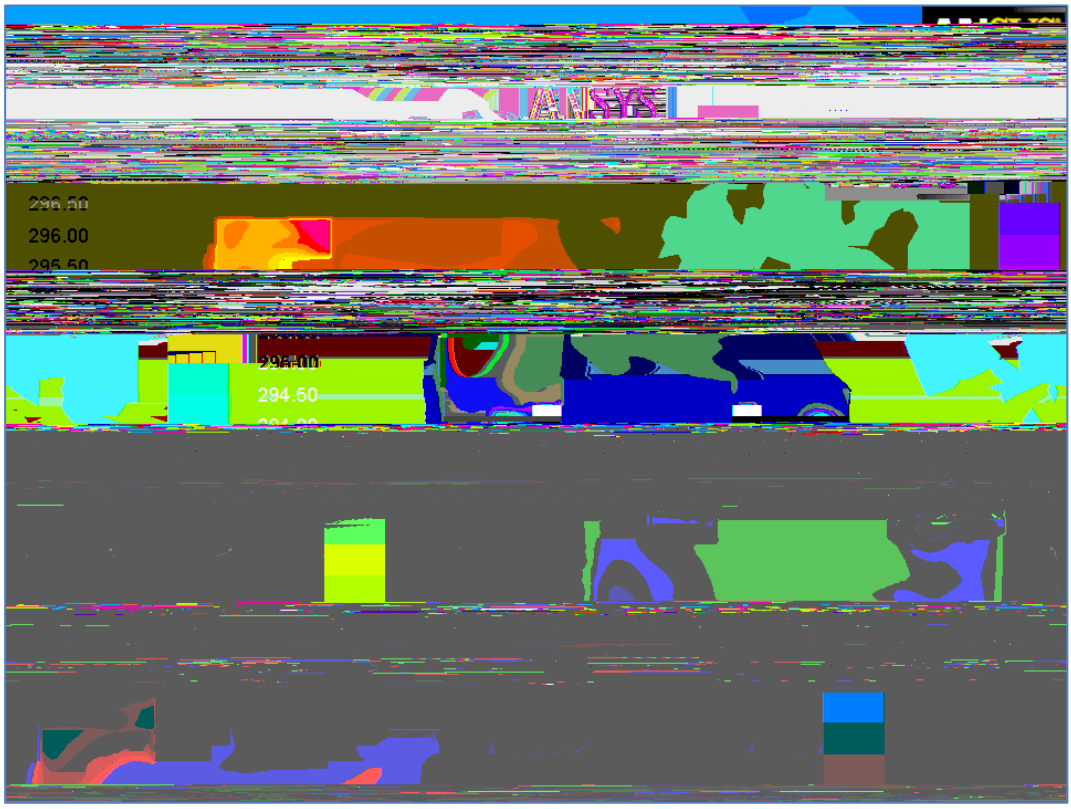
### 4.2.7.4 Bina model HM2 Lo LVÕF DNOÕN GD÷ÕOÕPODUÕ

Bina kuzey YH JQH\ FHSKHVLQGH NDODQ RGDODyuayLoHULVL
G ]OHP œHøNHLMØZZOH-ØHNLO YH GœeHNIGOJØHHUNLLQG-H
øHNL79) J|U OPHNWWRHQGXLoUDDUD J|UH U]JDUÕQ LON RODUDN
E|OJHVLQGH RGDODUÕQ LoHUpLKVHLVQLQGHNHLNVÕRDDNOVÕÑFDJNQHÕ÷Ç
G œ NROGX÷X J|U\OÕHDNWVHWGLUÕVÕÕPODUDDJ|UH RUWD NÇ
NDODQ RCEDLQDUQÕÕ N|œH \DQ NÕVÕPODVÕQÕ-NÕaDQÕRÕQÕO
L\L \D\ÕOGÕ÷Õ J|]OH-QPYHDNWÕFDLNUÕ÷Õ SHQFHUH HWNLVL\OE|OJHOHNWGHOPHNWHGLU YH SHQFHUHGHQ X]DNODœWÕN
J|U OPHNWWDIGÜLDW|XOQXQEGX÷X \]H\OHUGH RUWDODPD VÕF
RGODUGDNL RUWDODPD VÕFDNOÕN .¶GLU

ùHM4.22 Model HM2, Y1 G ]OHPLVÕGFHDNLOÕÑÕOÕPÕQÕQ NRQWXU RODU
J|VWHULPL




ù H M4.Z3O Model HM2, Y2 G ]OHPLVQGHDNLOÕÕP ÕQ ÕQ NRQWXU RODUDN J|VWHULPL




ù H M4.Z4O Model HM2, Y3 G ]OHPLVQGHDNLOÕÕP ÕQ ÕQ NRQWXU RODUDN J|VWHULPL

ù H M4.LZ5O Model HM2, Y4 G ] O H P L ŒQ GÕFHDNNLO ÕN

ù H M4.Z9O Model HM2, D4 G ] O H P L Q G H N L Õ P Q Õ Q N R Q W X U R O D U D

2OXœWXUXODQ +0 PRGHOLQLQ \]H\ NRœXOODUÕQÕQ WDQÕPO
GH÷HUOHUL dL]HOJH YH dL]HOJH ¶GH YHULOPLœWL

### 4.2.8.1 Bina modeli HM3 LoLQ KÕ]GD÷ÕOÕPODUÕ

HM3 PRGHOL LoLQ ELQD PRGHOLQGH EDFDGHDEoXÕNXRODDQUDNÕNOÕ
DQDOL] \DSÕOPDVÕQGDQ VRQUDNL ELQD PH\GDQD JHOLUHQHNOHUL
\DWD\ YH G œH\, **G ]OHPOHUGH** EXOXQPD SR]LV\RQODUÕQD J|U
.RQWXU YH YHNW|UHO RODUDN G ]OHP VRQXoODUÕHGH HG
NDUœÕ J|œWHUPLœ ROGX÷X GLUHQo VRQXoODUGDQ EHOOL
GD÷ÕOÕPODUÕQGD KDYDøHNÕOOHUL øH-NøLHNLO
¶GEDHOLUJLQ RODUDN J|U OPHNWHGLU

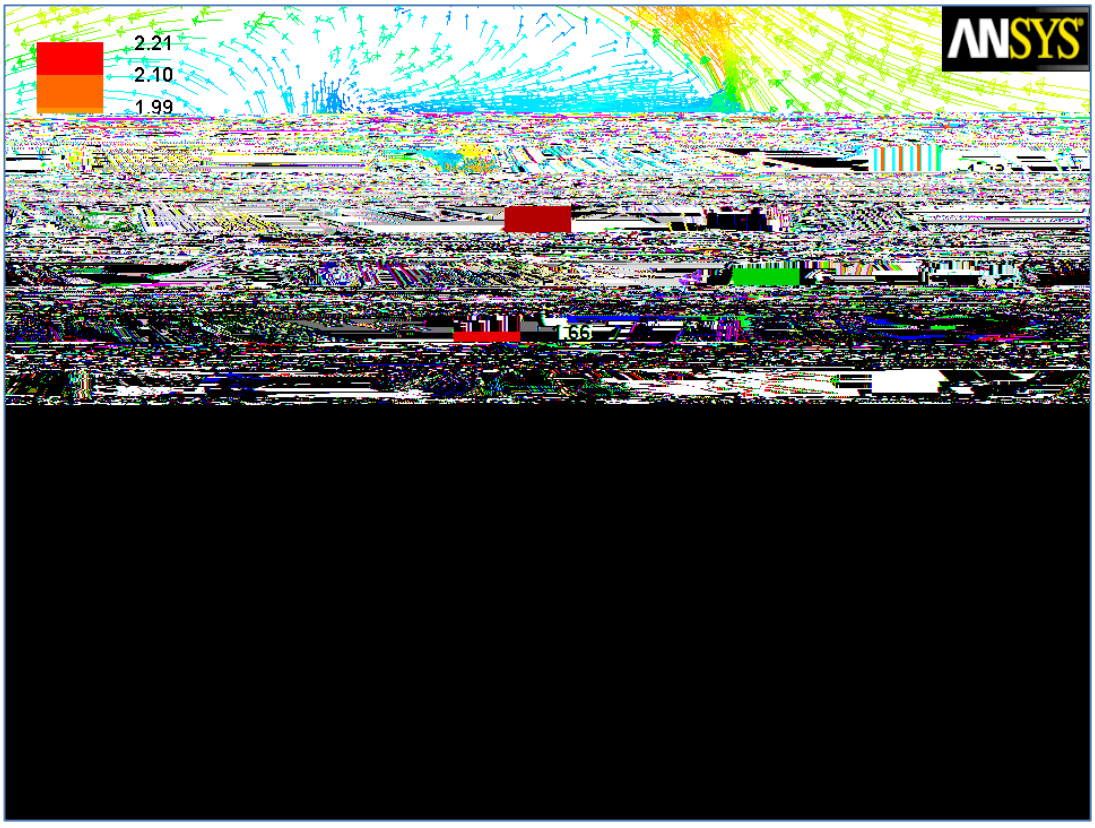
$oÕNOÕNODUÕQ NÕVPHQ NDSDOÕ RDoÕNDÕNÕODSÜÕQD QEÕeDGXUVXPHGU
ROGX÷X GLUHQo EHOLUJLQ ELU œHNLOGH4.27V–RQ]XHoOLDHUGDQ J|U
4.29).

HM1 mRGHOLQGH NX]H\ FHSKHVLQGHNL DoÕNOÕNODUGDQ JLUHQ
P VQ LNHQ SHQFHUHOHULQHMÕNÕVÕQDDazalamakE,X7 GH÷HU
P VQ ROPXXeWHXU $\QÕœHNLOGH NLQDGH QH\ FHSKHVLQGHNL DoÕNOÕ
JLUHQ KDYDPÕQÕQÕQÜWDPDVQ LNHQ SHQFHUHOHULQ NÕVÕOPDVÕ
D]DODUDN P VQL]HOPJXHœW%XDUFD NÕVPÕQGDNL DoÕNOÕNODUÕ
ortalama U]JDU KÕ]ÕGH÷HUL D]DODUDN P VQ¶GHQ P VQ
dL]HO27HH

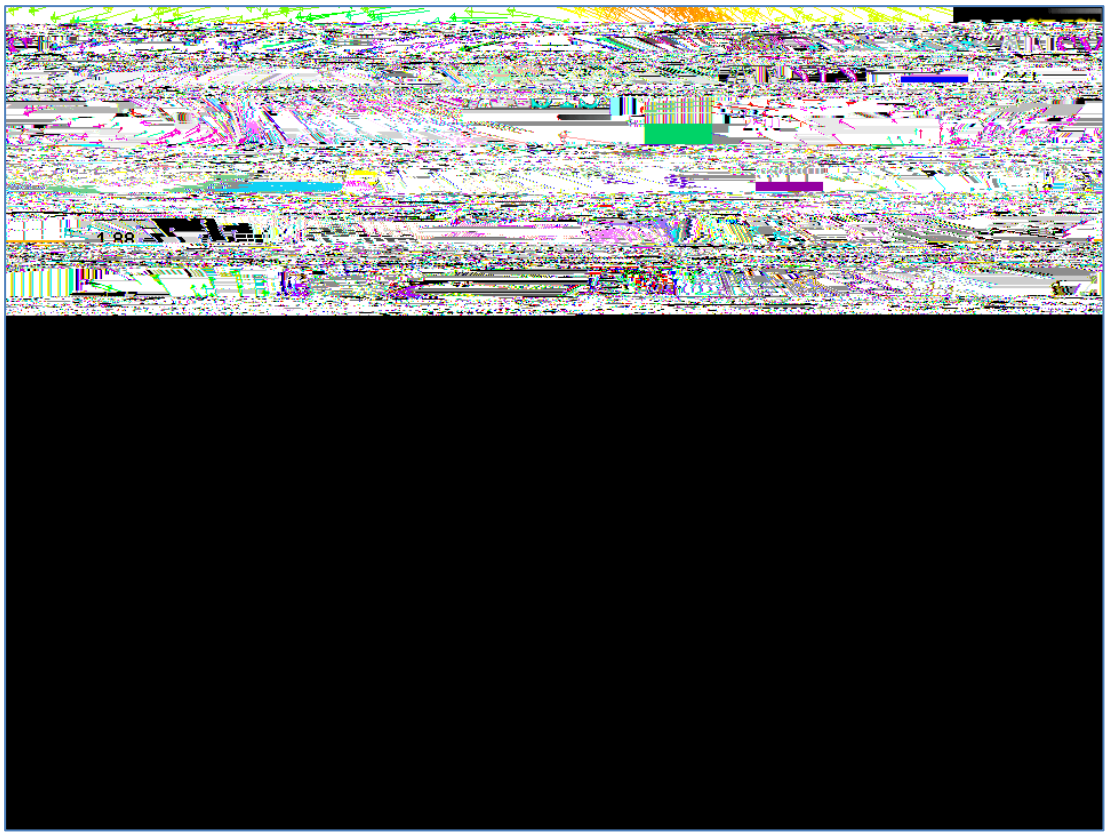
5]JDUÕQHWLNLOL ROGX÷XQXGHOJHVRQXoODUÕQD SDUDOHO RODUDN
œHNLOOHUGHQ DQODPÕQÕ8eÕøHNLOWDVÕQÕ NøHWOHUD GR÷UX oÕNÕODGÕN
LoLQH JLUHQ KDYDQÕQ RGDGD GD÷ÕOPD HWNLVLQH D]DOGÕ÷ÕQ
G ]OHPGH DVURQLXcFHOHQGL÷LQGH VD÷ NÕVÕPGDQ oÕNDQ KDYDQ
NDUœÕOÕNOÕmRODDQGÕUÕNRQeXE|JHOHUH JLULœLQGH KÕ]ÕQÕQ D]
(øHNLO øHøHNLOLO øHNLO dL]HOJH $\QÕQHOJH
]DPDQGD VW NÕNWDOEXDKDÕNÕODGNWDUÕP KÕ]ÕGDKD GD D] ROPD



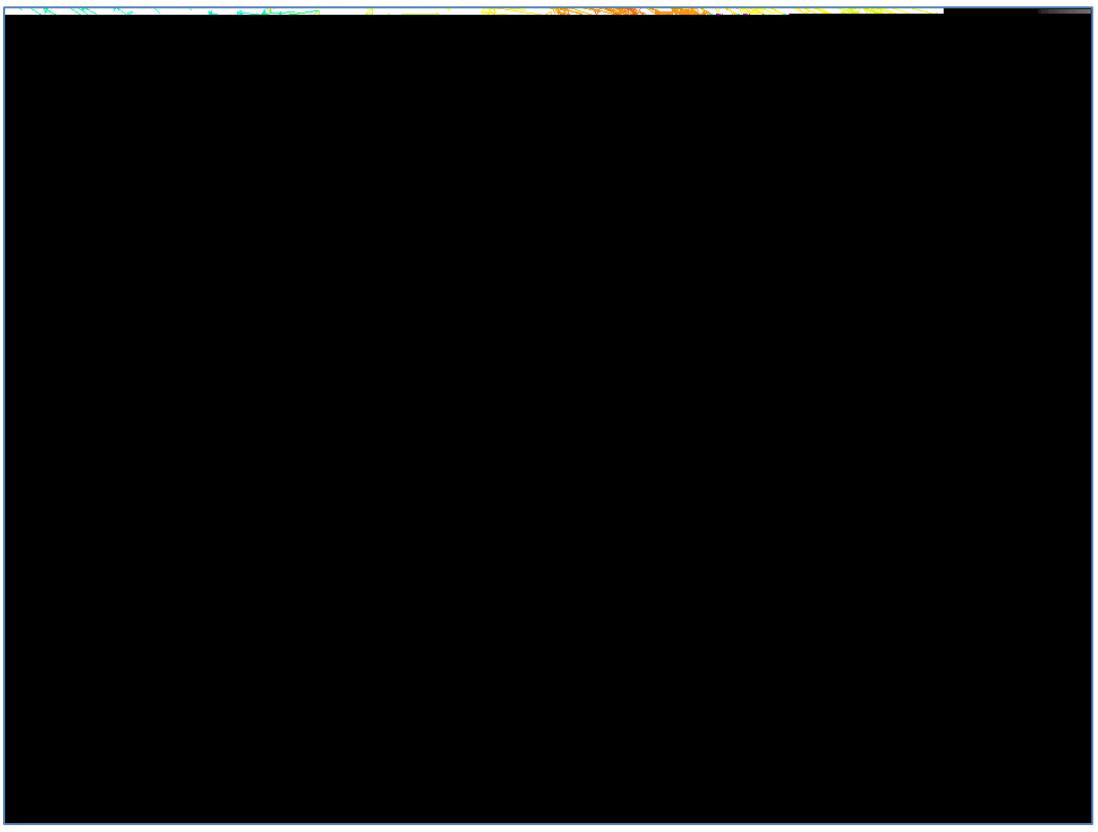
ù H N 8.1O Model HM3 L o Ƙ Q G ] O H P L Q G H N L Y H N W | U H O K Õ] G D




ù H N 8.2O Model HM3 L o Ƙ Q G ] O H P L Q G H N L Y H N W | U H O K Õ] G D



ù H N B3O Model HM3 L o ⊱Q G ]O H P L Q G H N L Y H N W | U H O K Õ] G D ÷Õ O Õ P



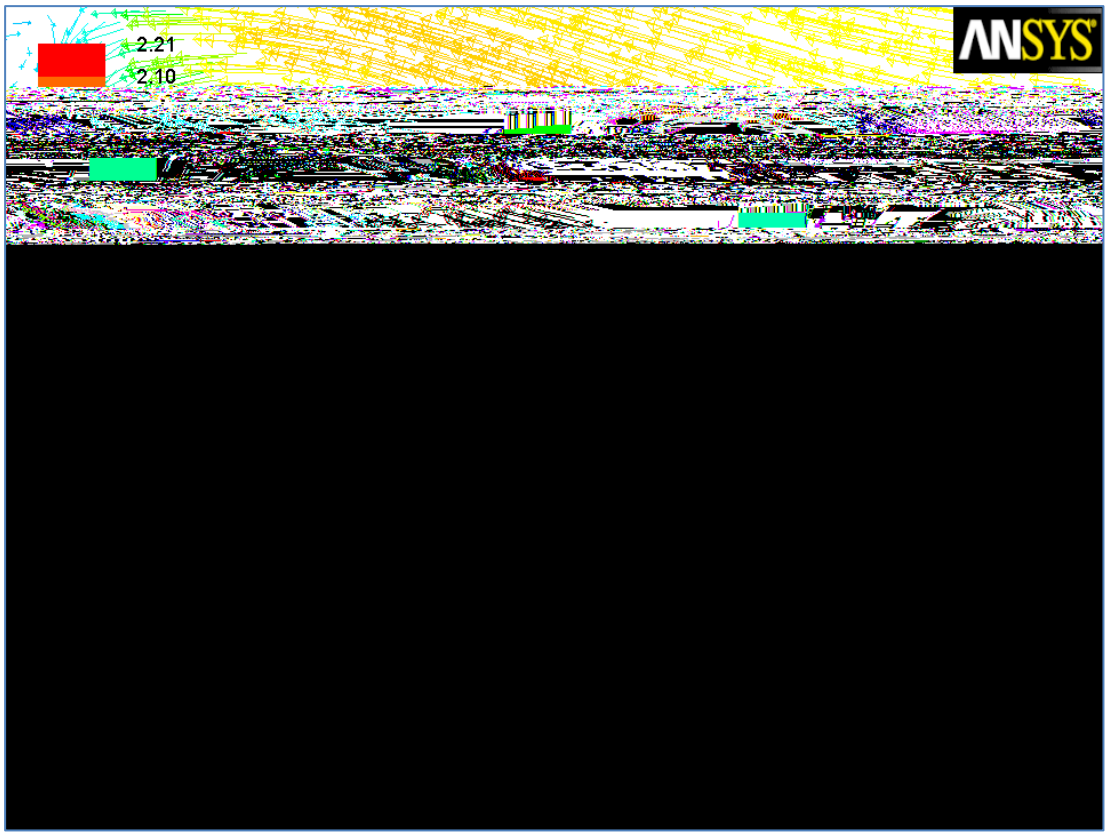
ù H N B4O Model HM3 L o ⊱Q G ]O H P L Q G H N L Y H N W | U H O K Õ] G D ÷Õ O Õ P



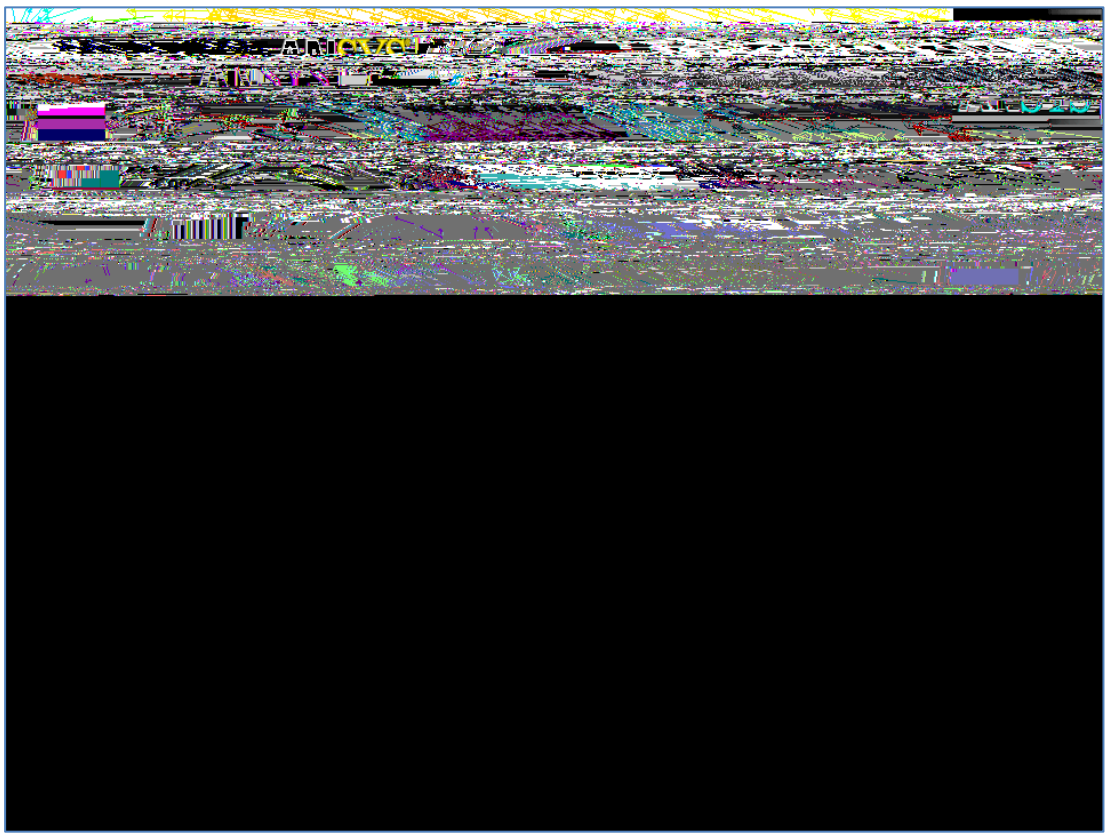
ù H N 8.5Õ Model HM3, < G ] O H P L Q G H N L K Õ] G D ÷Õ O Õ P Õ Q Õ Q N R Q W X



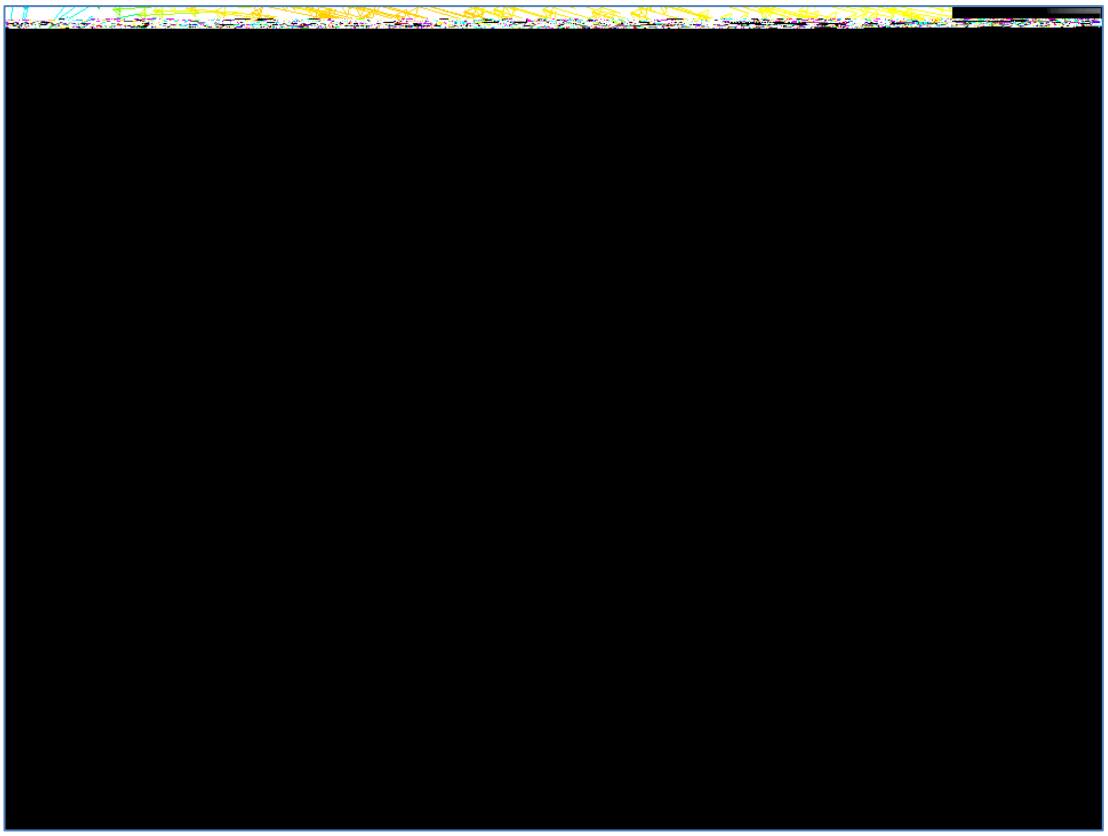
ù H N 8.6Õ Model HM3, < G ] O H P L Q G H N L K Õ] G D ÷Õ O Õ P Õ Q Õ Q N R Q W X



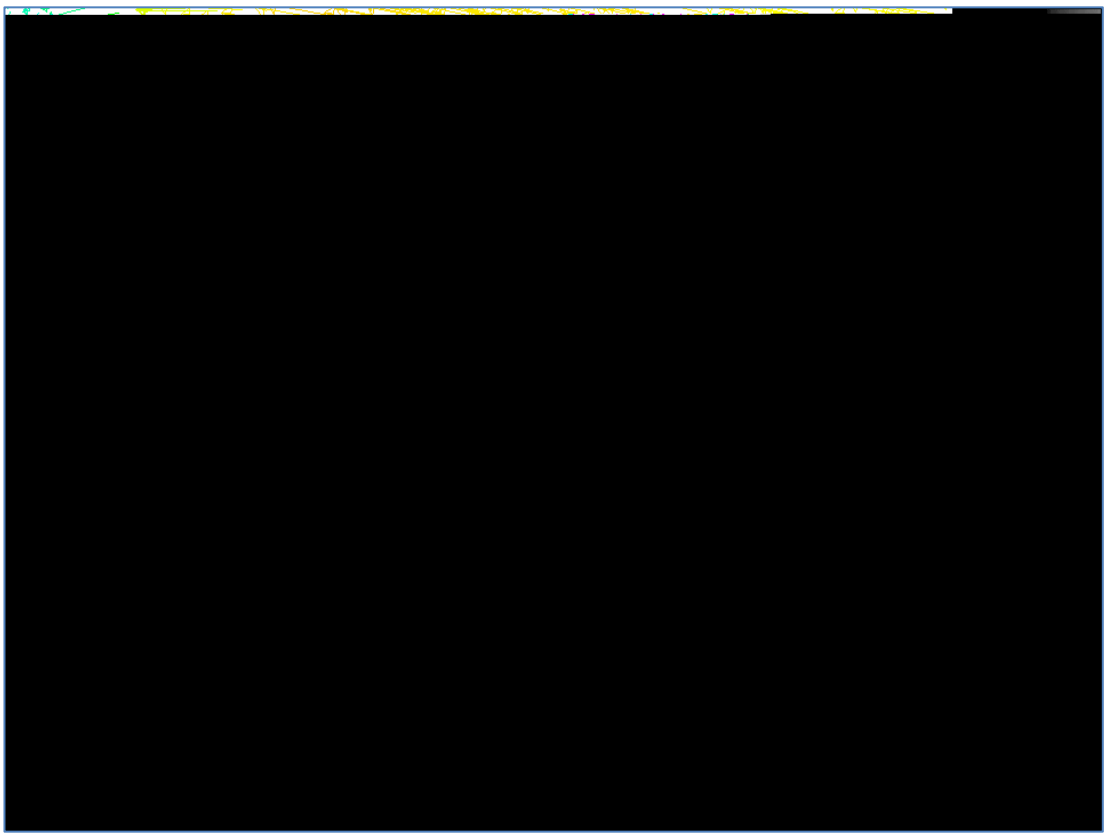

ùHNÒ8ÞO Model HM3 LoÐ1QG ]OHPLQGHNL YHNW|UHO KÕ] GD÷ÕOÕP



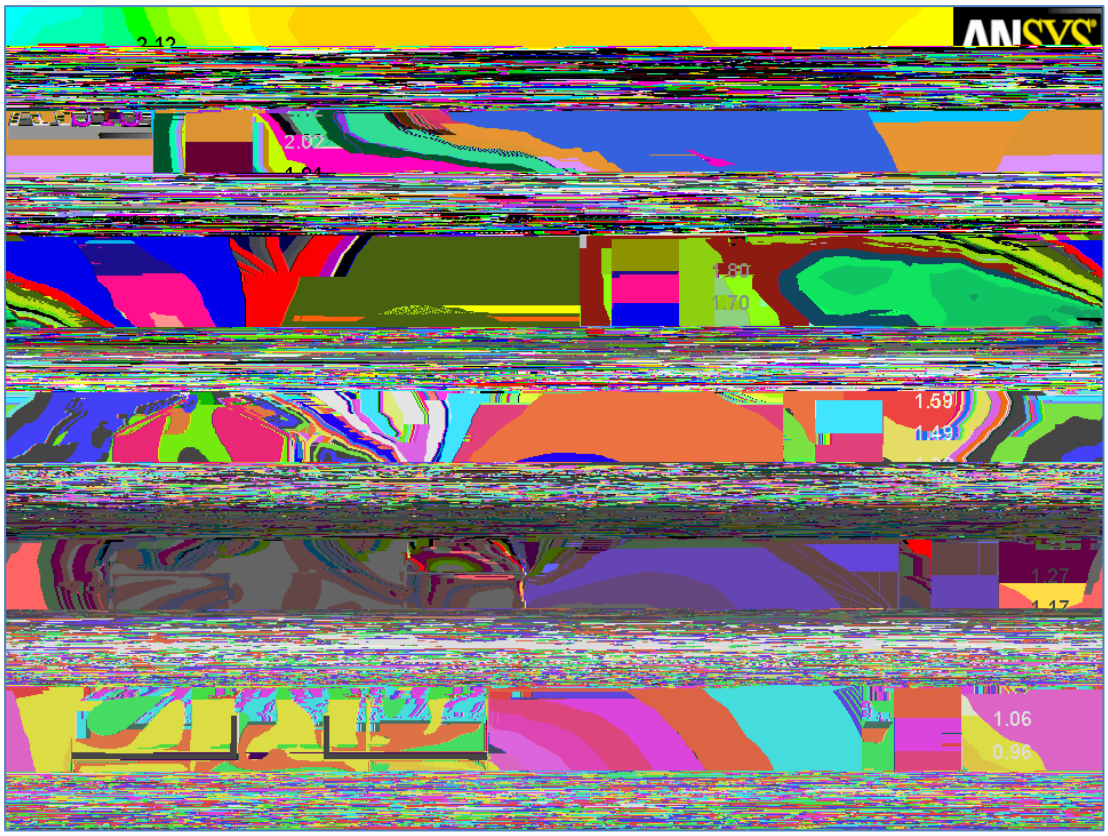
ùHNÒ88O Model HM3 LoLQ ’ G ]OHPLQGHNL YHNW|UHO KÕ] GD÷Õ



ùHNHO Model HM3 LoLQ ’ G ]OHPLQGHNL YHNW|UHO KÕ



ùHNHO Model HM3 LoLQ ’ G ]OHPLQGHNL YHNW|UHO KÕ




ùHN910 Model HM3, ’ G ]OHPLQGHNL KÕ] GD÷ÕOÕPÕQÕQ NRQWXU ROD




ùHN920 Model HM3, ’ G ]OHPLQGHNL KÕ] GD÷ÕOÕPÕQÕQ NRQWXU ROD

dL]H4027H Bina model HM3 LoLQ EDFD DoÕNOÕNODUÕQGDQ JLUHQ YH oÕNDQ KDYDQÕQ I

| 5 ]JL<br><|Q | 5 ]JL+Õ]Ç (m/sn) | %DFDGD %XOXQDQ $oÕNOÕNODUGD<br>%DFD $oÇ 7DUDIÕ | +Õ] P VQ |
|---|---|---|---|
| Kuzey | 1,5 | Kuzey - 6D÷ | 0,23 |
| | | *QH-Sol | 0,43 |
| Ortalama | | | 0,33 |

dL]H4028H Bina model HM3 LoLQ NX]H\ FHSKHVLQGHNL SHQFHUHOHUGHQ JLUHQ YH oÕND

| | %LQD .X]H\ &HSKHVLQGHNL 3HQFHUHOHULQG | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Kat 1 | +Õ] P V | Kat 2 | +Õ](m/sn) | Kat 3 | +Õ] P V | Kat 4 | +Õ] P V | |
| udf1r1 | 0,62 | udf2r1 | 0,57 | udf3r1 | 0,53 | udf4r1 | 0,39 | |
| udf1r2 | 0,62 | udf2r2 | 0,59 | udf3r2 | 0,56 | udf4r2 | 0,45 | |
| udf1r3 | 0,61 | udf2r3 | 0,58 | udf3r3 | 0,56 | udf4r3 | 0,45 | |
| udf1r4 | 0,63 | udf2r4 | 0,58 | | | | | |

dLi]H4O29H Bina model HM3 LoLQ JQH\ FHSKHVLQGHNL SHQFHUHOHUGHQLQLQ YH oÕNDO

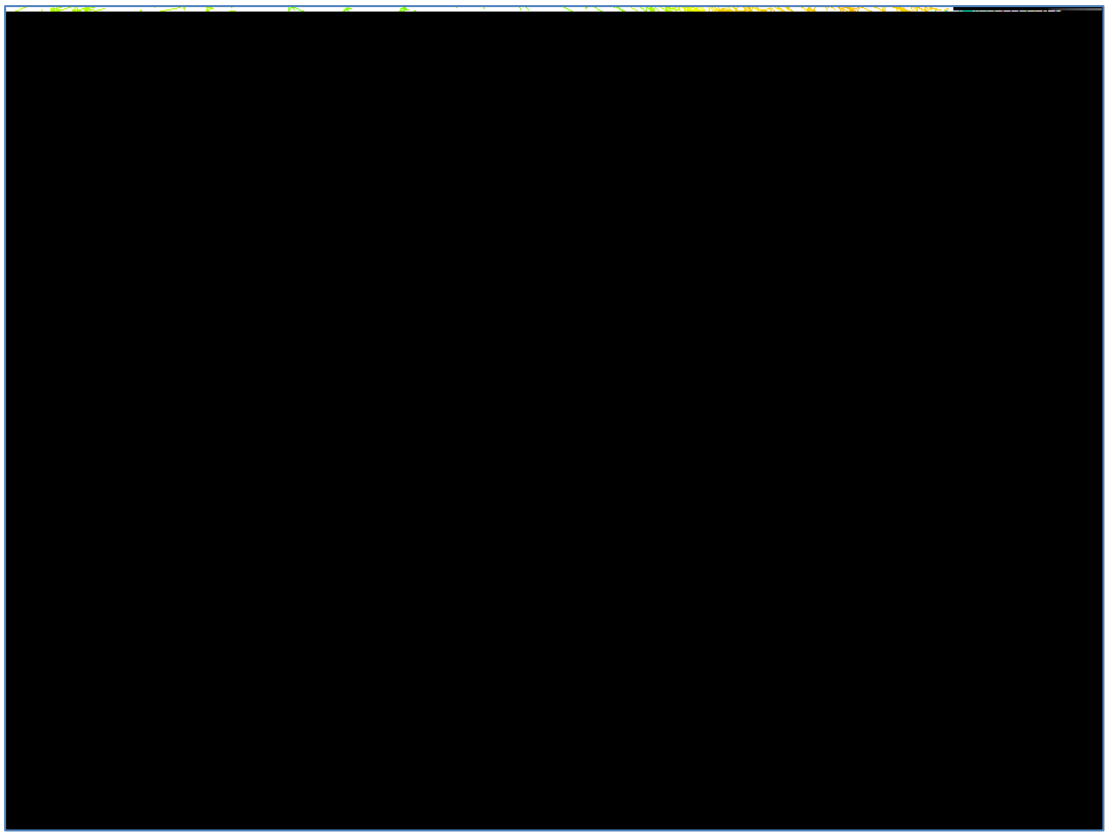
| %LQD *QH\ &HSKHVLQGHNL 3HQFHUHOHULQG | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Kat 1 | + Õ] | P | V | Kat 2 | + Õ] | P | V | Kat 3 | + Õ] | P | V | Kat 4 | + Õ] | P | V |
| udf1l1 | 0,31 | | | udf2l1 | 0,32 | | | udf3l1 | 0,33 | | | udf4l1 | 0,32 | | |
| udf1l2 | 0,36 | | | udf2l2 | 0,35 | | | udf3l2 | 0,33 | | | udf4l2 | 0,29 | | |
| udf1l3 | 0,24 | | | udf2l3 | 0,27 | | | udf3l3 | 0,21 | | | udf4l3 | 0,24 | | |
| udf1l4 | 0,22 | | | udf2l4 | 0,25 | | | udf3l4 | 0,27 | | | udf4l4 | 0,27 | | |
| uwf1l1 | 0,22 | | | uwf2l1 | 0,26 | | | uwf3l1 | | | | | | | |

### 4.2.8.2 Bina modeli HM3 LoLQ EDVÕQo GD÷ÕOÕPODUÕ

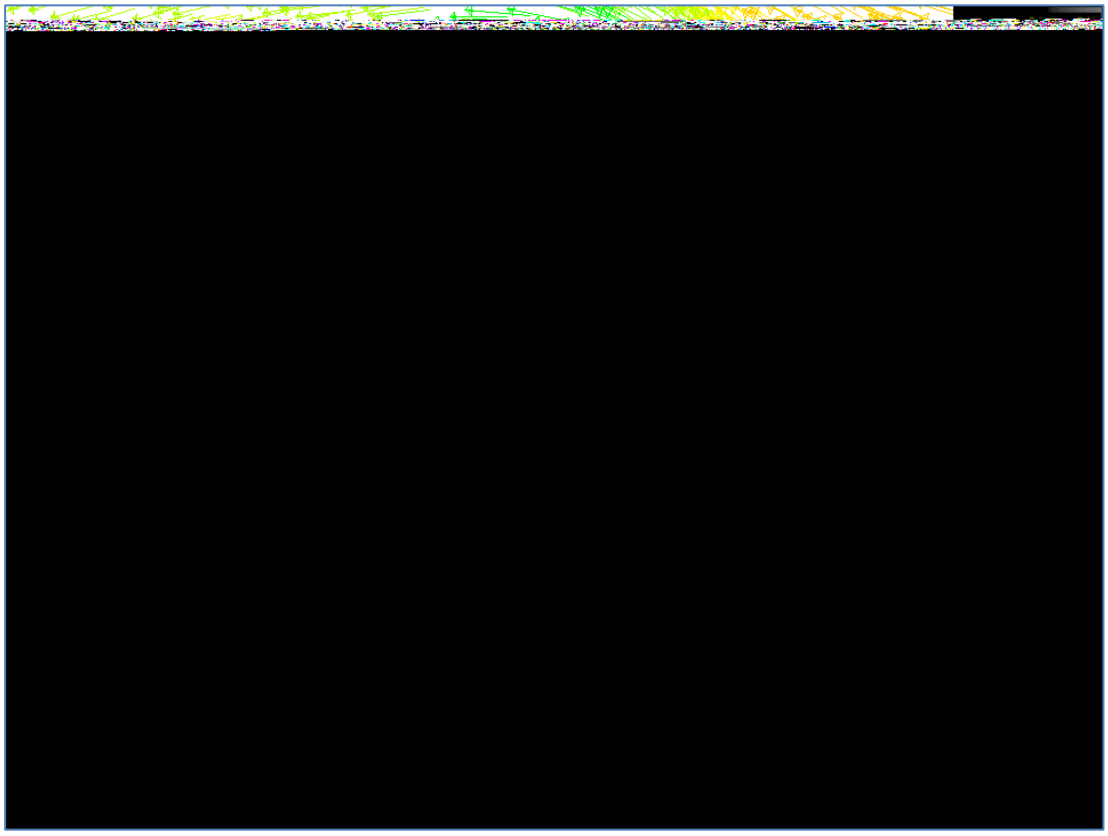
+0 0RGHOL LoLQ WDQÕPODPDVÕQGD ]GD÷ÕOÕPODUÕ RODUDN93 øHøNLOLO J|VWHULOPLœWLU $\UÕFDEDVÕQoÕNOD GD÷ÕOÕPODUÕ dL]HOJHO3H dL]HOJHGH YHULOHUHœWLU FHSKHVLQGHNL DoÕNOÕN \]H\OHUL QVHNO RNWODODPD EDVÕQo SDVFDO FI GR÷UXOWXVXQGD EDVÕQo JLGHUHN GœPHNWHGLU %LQ NDWODUD J|UH GD÷ÕOÕPÕQGDNL EDVÕQo GH÷HUOHQGLULOHFH GR÷UX oÕNÕOGÕNoD EDVÕQFÕQ DUWWÕ÷Õ J|U OPHNWHGL LQFHOHQGL÷LQGH EDVÕQo YHNW|U GD÷ÕOÕPÕQÕQ KÕ] YHNW J|U OPHNWHGLU



ùHM4.23O 0RGHO +0 <LoLQOHPLQGHNEDVÕQÕ÷Õ|UPHÕO



ùHM4.94O 0RGHO +0 <LoGLQOHPLQGHNEDYÕQDWÕQÇPÕO



ùHM4.95O 0RGHO +0 LGLJQOHPLQGHNEDYÕQDwÕQÇPÕO



ù H M4.96O 0RGHO +0 L6LQH PLQGHNEDYÕÕQÕQ



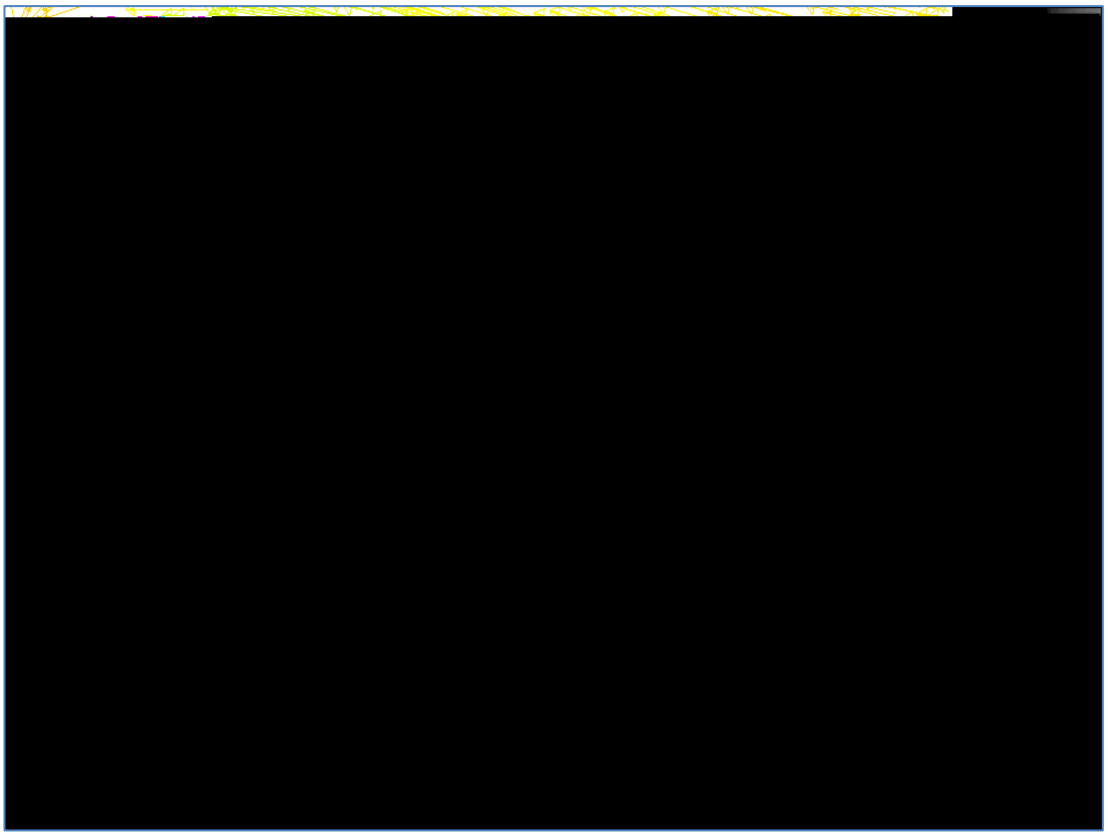

ù H M4.97O Model HM3, < G ]OHPLEQGHÕQDÕOÕPÕQÕQ NRQWXU RODUD
J|VWHULPL



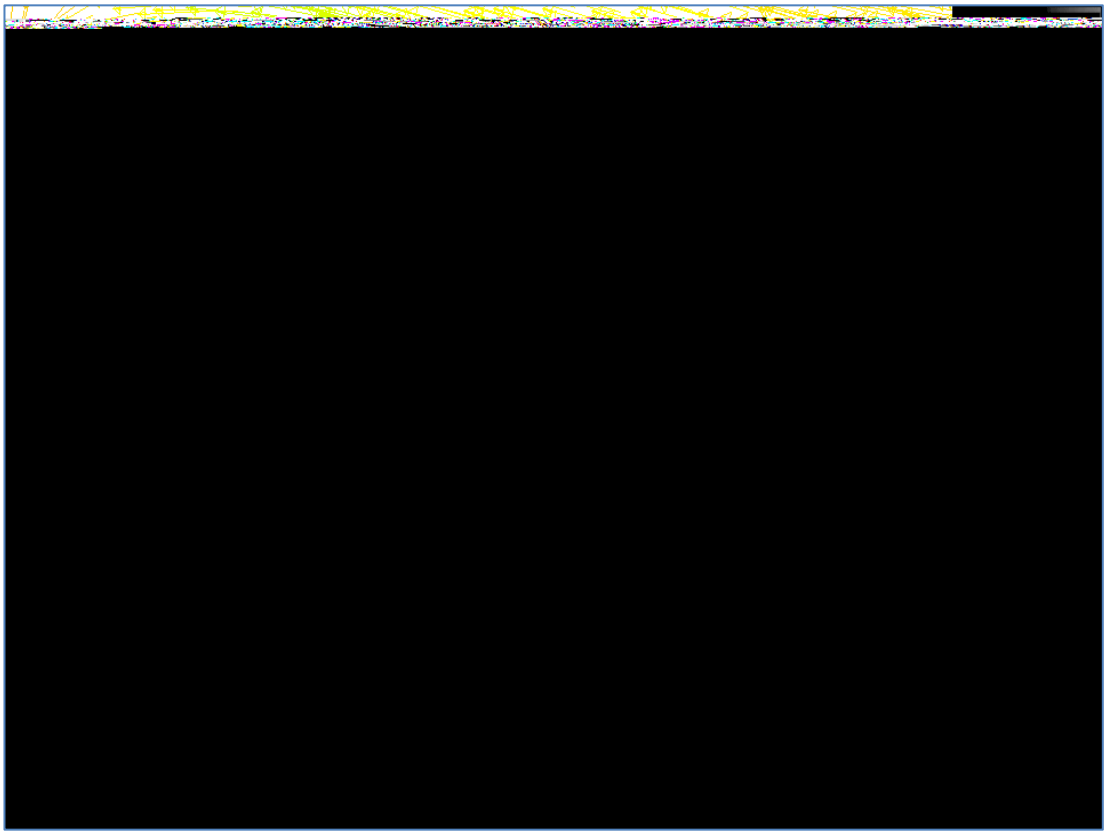
ù H M4.98O Model HM3, < G ] O H P LEQDGVHÕQDÕO ÕP ÕQ ÕQ N R Q W X U R O D U D N J | V W H U L P L



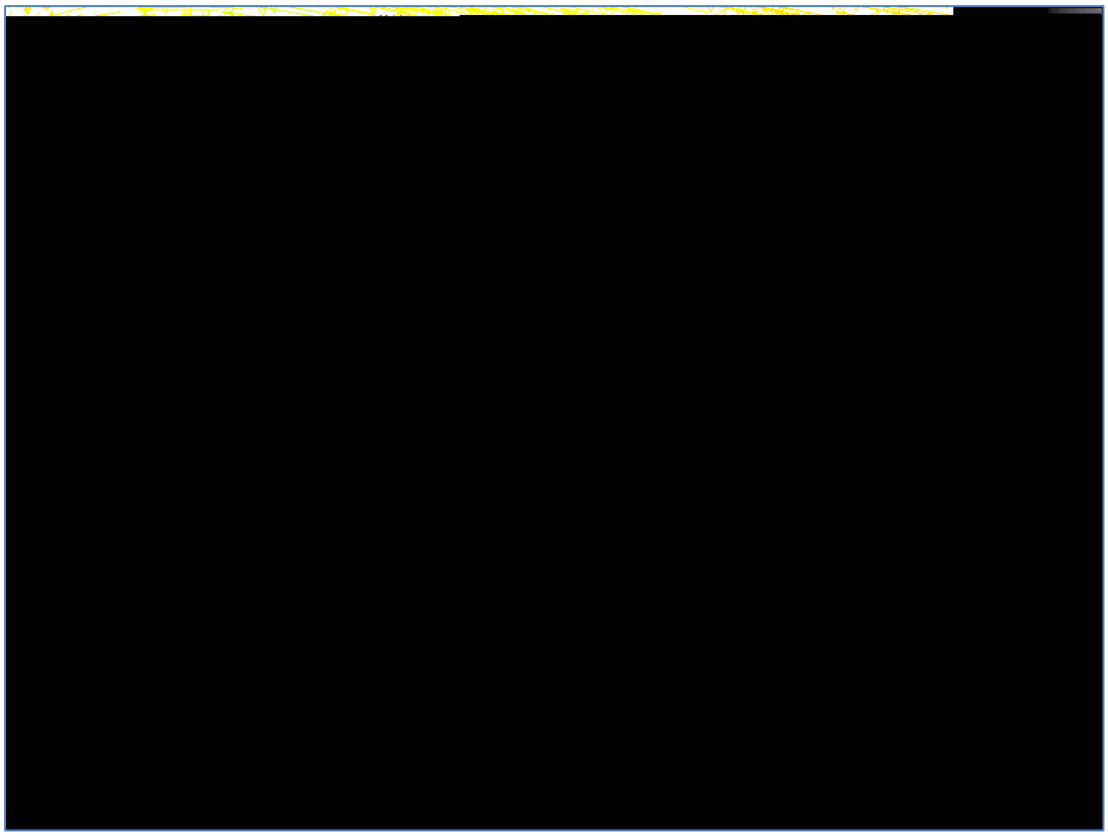
ù H M4.99O 0 R G H O + 0 ’ L 6L ]QO H P L Q G H NELD Y ÕQDÕWÕQ ÕP ÕQ ÕQ



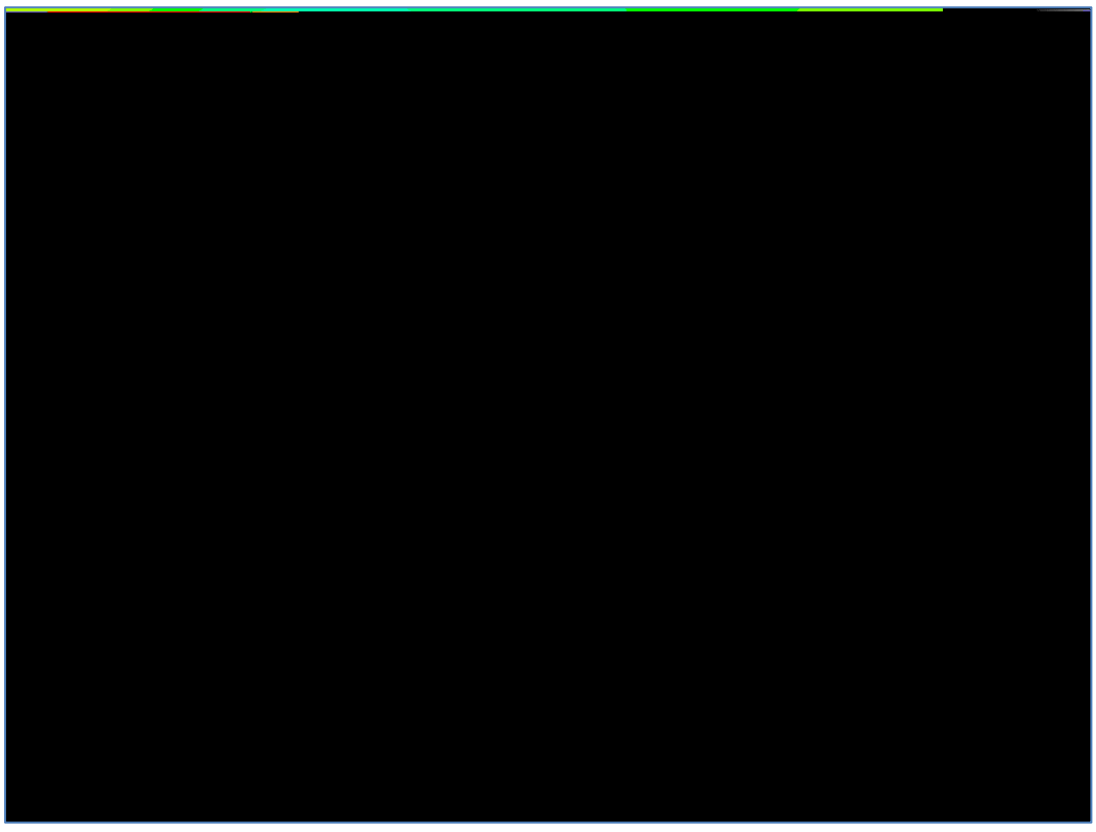
ù H M4.1.00: 0 R G H O + 0 D 1 6 L Q Q H P L Q G H N E L D Y Ê Q Ñ o w Q U Õ P H Õ



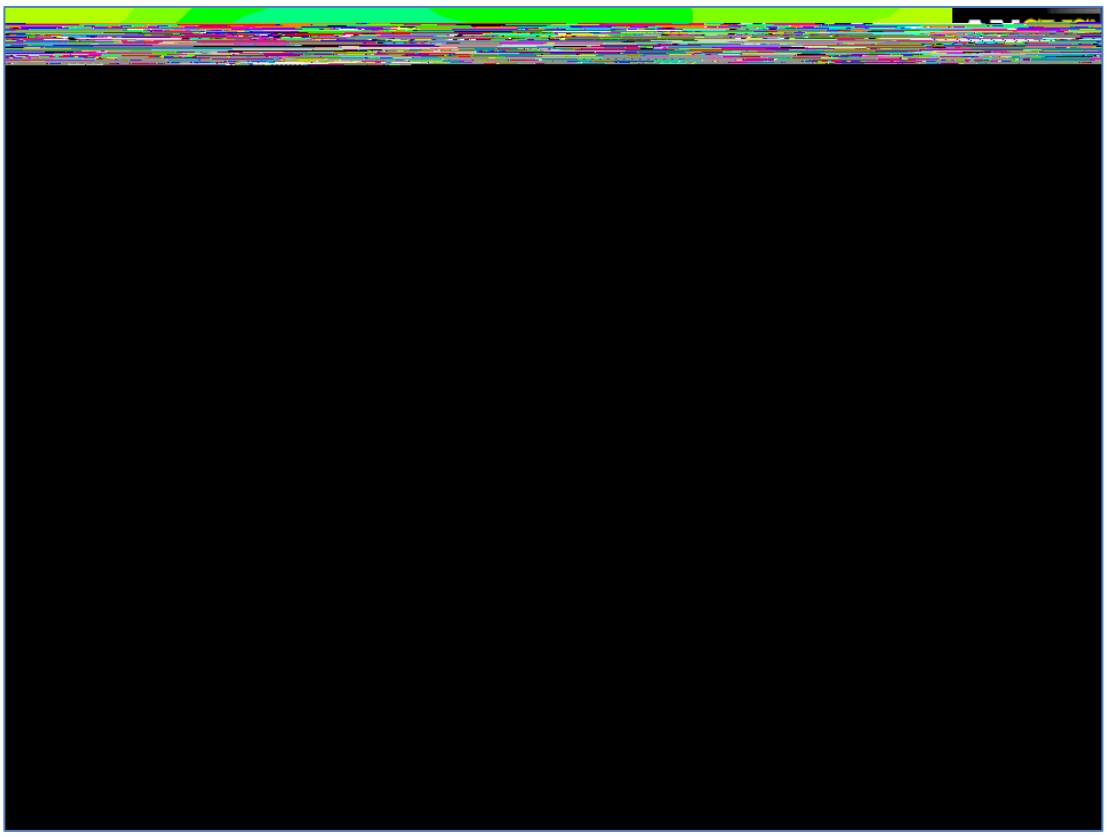
ù H M4.1.01: 0 R G H O + 0 L 6 L Q Q H P L Q G H N E L D Y Ê Q Ñ o w Q U Õ P H Õ



ù H N4.102: 0RGHO +0 LGLQQHPLQGHNLDYHQWÕQWÕPÕ



ù H N4.103: Model HM3, ’ G ]OHPLEQGHÕOÕPÕQÕQ NRQWXU RODUDN J|VWHULPL



ù H M4.1024: Model HM3, D4 G ] O H P L Q D W Ñ Q o Õ P Õ Q Õ Q N R Q W X U R O D U D N J | V W H U L P L

d L ] H 4 0 3 0 H % L Q D P R G H O + 0 L o L Q E D F D D o Õ N O Õ N O D U Õ Q G D N

| 5 ]JD <\|Q | 5 ]JL +Õ]Õ (m/sn) | %DFDGD %XOXQDQ%$oVÕÕQoÕN 0 EÕUGÕÕN |
|---|---|---|
| | | %DFD $oÕ 7DUDIÕ | P (pascal) |
| Kuzey | 1,5 | Kuzey - 6D÷ | 0,69 |
| | | * QH-Sol | 4,37 |
| Ortalama | | | 2,53 |

dL]HOHUL %LQD PRGHO +0 FLoLQHVX\QHG\HNL SHQFHUHOHUGHNL EDVÕQo GH÷HU

| %LQD .X]H\ &HSKHVLQGHNL 3HQFHUHOHULQG | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kat 1 | P (pascal) | Kat 2 | P (pascal) | Kat 3 | P (pascal) | Kat 4 | P (pascal) |
| udf1r1 | 1,07 | udf2r1 | 1,14 | udf3r1 | 1,17 | udf4r1 | 1,02 |
| udf1r2 | 1,30 | udf2r2 | 1,36 | udf3r2 | 1,35 | udf4r2 | 1,06 |
| udf1r3 | 1,31 | udf2r3 | 1,36 | udf3r3 | 1,35 | udf4r3 | 1,07 |
| udf1r4 | 1,10 | udf2r4 | 1,16 | udf3r4 | 1,17 | udf4r4 | 1,02 |
| uwf1r1 | 1,42 | uwf2r1 | 1,48 | uwf3r1 | 1,47 | uwf4r1 | 1,17 |
| uwf1r2 | 1,65 | uwf2r2 | 1,67 | uwf3r2 | 1,62 | uwf4r2 | 1,22 |
| uwf1r3 | 1,65 | uwf2r3 | 1,65 | uwf3r3 | 1,62 | uwf4r3 | 1,21 |
| uwf1r4 | 1,45 | uwf2r4 | 1,49 | uwf3r4 | 1,48 | uwf4r4 | 1,18 |
| Ortalama | 1,37 | | 1,41 | | 1,40 | | 1,12 |

dL]HOHUL %LQD PRGHO +0 LoLQ J QH\ FHSKHVLQGHNL SHQFHUHOHUGHNL ED

| %LQD * QH\ &HSKHVLQGH%NDVÕQÕQ F HUÕHÕU LQ | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kat 1 | P (pascal) | Kat 2 | P (pascal) | Kat 3 | P (pascal) | Kat 4 | P (pascal) |
| udf1l1 | | | | | | | |

#### 4.2.8.3 Bina modeli HM3 LoLQ N•WOH GHQJHVL

%LQD PRGHOL ]HULQGH EXOXQDQ DoÕNOÕNODUGDQ
EDKVHGLOPLœWL $QDOL] LoLQ WDQÕPODQDQ DoÕNOÕNO
JLUHQÕYDQoRDNWDUODU3Õ-dLL]HOJHIe YHUiOPLœ

7DEORODU LQFHOHQGL÷LQGH NX]H\ YH J QH\ \|Q QGH E
KDYD PLNWDUÕQÕQ GHQJHOL izelgeG4X3=XYJ|Ud0]HB5)WHGLU
$oÕNOÕNODUÕQ GXUXPXÕQ|]DQ]HQFHUÕQGHNLWDUÕQ0KDYD
PRGHOLQH J|U.HQDF]HDOHPÕWÕFHOLNOH KDYDQÕQ LON RODU
@PO

d L ] H 4 C 3 4 H Bina model HM3 L o L Q N X ] H \ F H S K H V L Q G H N L S H Q F H U H O H U G H Q J L U H Q Y H o Õ N

| 5 ] J D U < \ Q | 5 ] J D U + Õ ] Õ (m/sn) | % L Q D . X ] H \ & H S K H V L Q G H N L 3 H Q F H U H O H U L Q G | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Kat 1 | Debi (kg/s) | Kat 2 | Debi (kg/s) | Kat 3 | Debi (kg/s) | Kat 4 | Debi (kg/s) |

d L ] H 4 O 3 5 H Bina model HM3 L o L Q J Q H \ F H S K H V L Q G H N L S H Q F H U H O H U G H Q J L U H Q Y H o Õ N

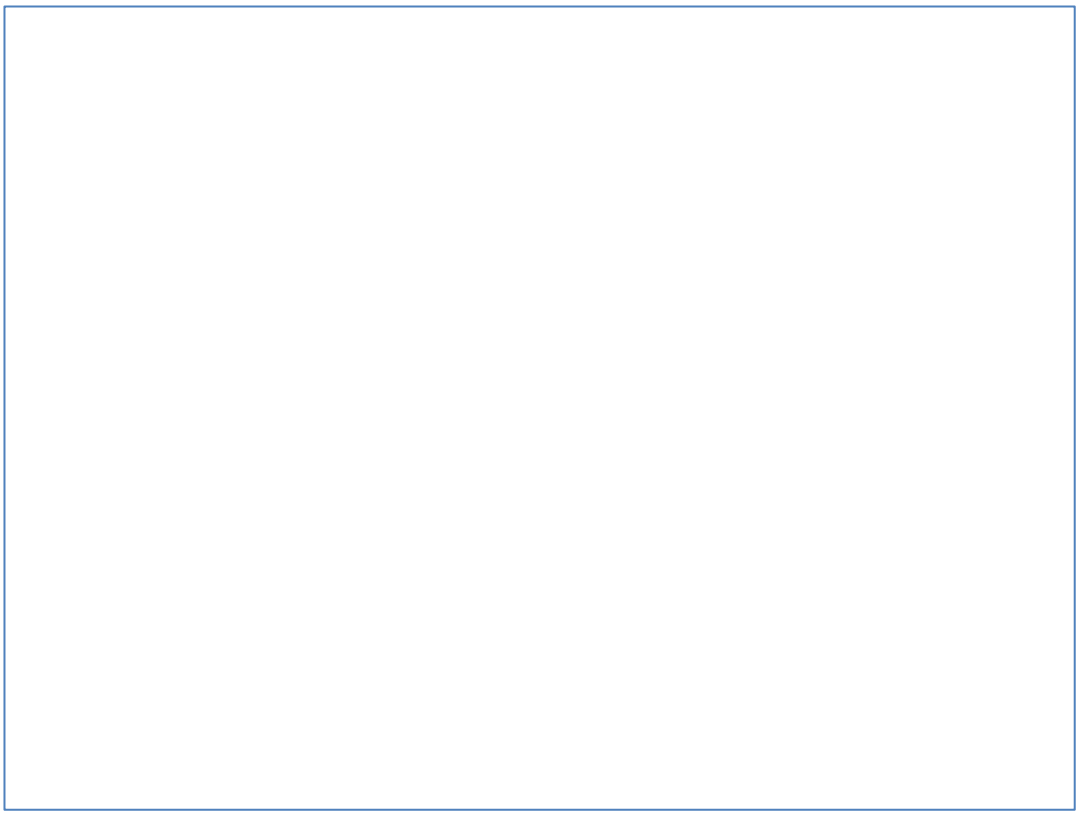
| | | |
|---|---|---|
| 5 ] J D Ù <\| Q | 5 ] J D Ù + Õ] Õ (m/sn) | % L Q D * Q H \ & H S K H V L Q G H . NW L O 3 H H V Q H F H U H E L U H E L U H € H G U H C |

4.2.8.4 Bina model HM3 LoLQ FDNOÕN GD÷ÕOÕPODUÕ

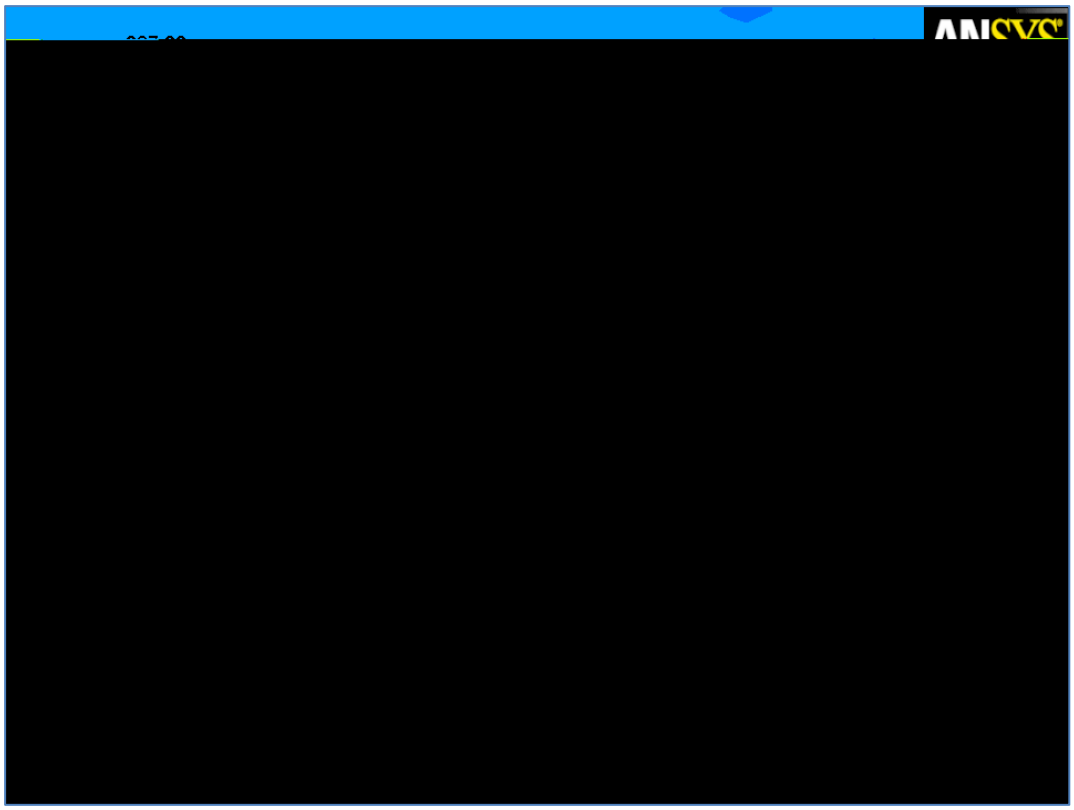
$QDOL] LoLQ XJXQODQÕ ÇHOLNOL]LPL ORUWDODPD KÕ] m/sn ve



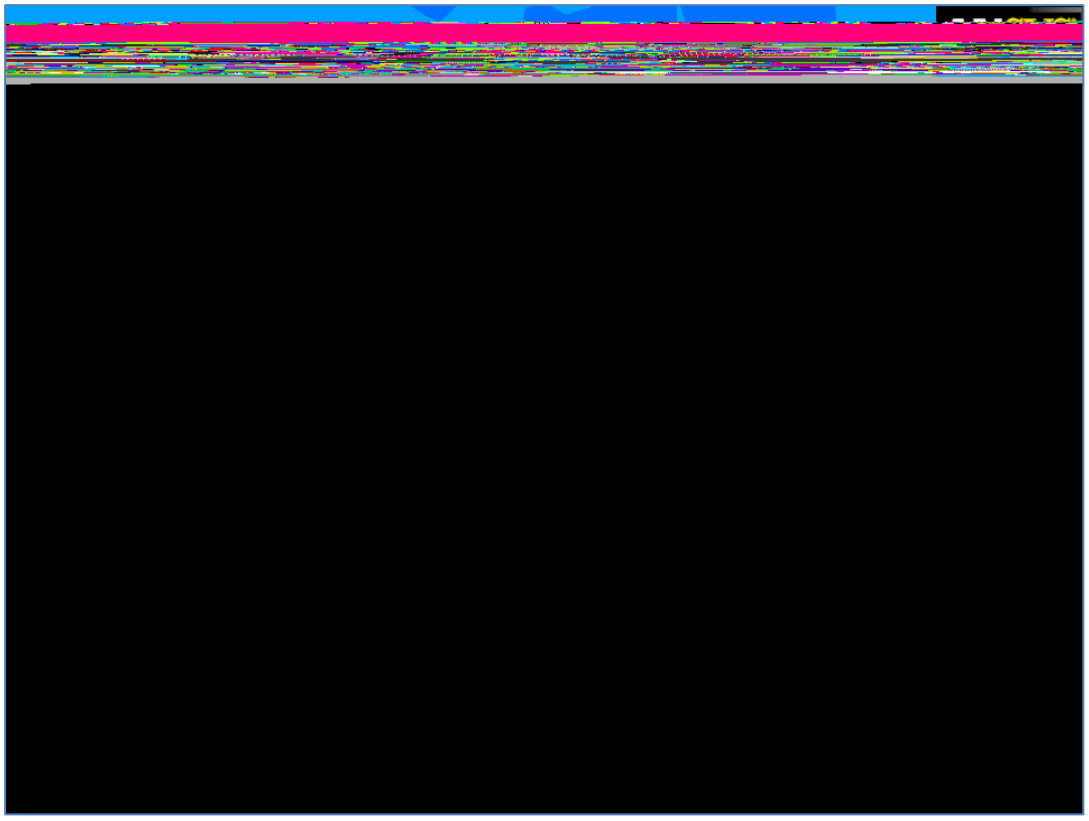
ù H M4.106: Model HM3, Y2 G ]OHPLVGHNLOÕPÕQÕQ NRQWXU RODUÕ
J|VWHULPL



ù H M4.107: Model HM3, Y3 G ]OHPLVGHNLOÕPÕQÕQ NRQWXU RODUÕ
J|VWHULPL



ù H M4.108: Model HM3, Y4 G ]OHPLVÕGHDNLOHÑOÕPÕQÕQ NRQWXU RODUDN J|VWHULPL



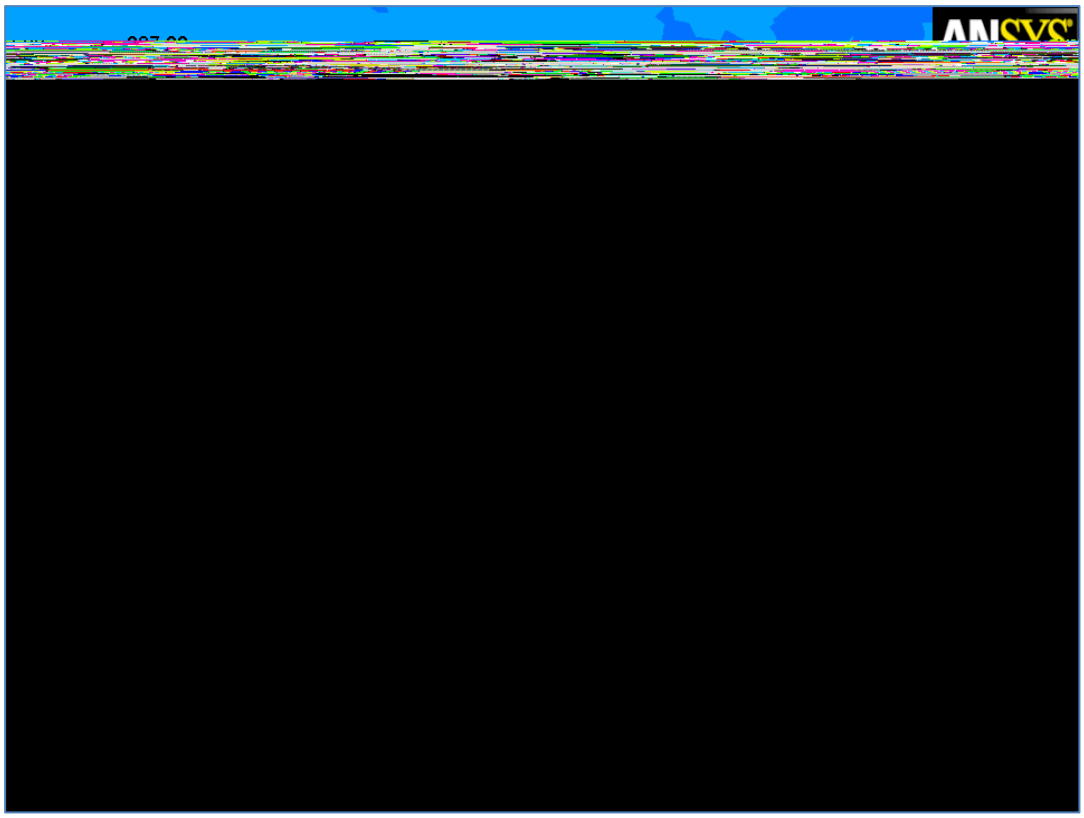
ù H M4.109: Model HM3, D1 G ]OHPLVÕGHDNLOHÑOÕPÕQÕQ NRQWXU RODUDN J|VWHULPL




ù H M4.110: Model HM3, D2 G ]OHPLVQGHDNLOÕP ÕQÕQ NRQWXU RODUD
J|VWHULPL




ù H M4.111: Model HM3, D3 G ]OHPLVQGHDNLOÕP ÕQÕQ NRQWXU RODU
J|VWHULPL



ù H M 4.1.12 Model HM3, D4 G ] O H P L VQ GH NLO PQ NRQWXU RODUDN J|VWHULPL

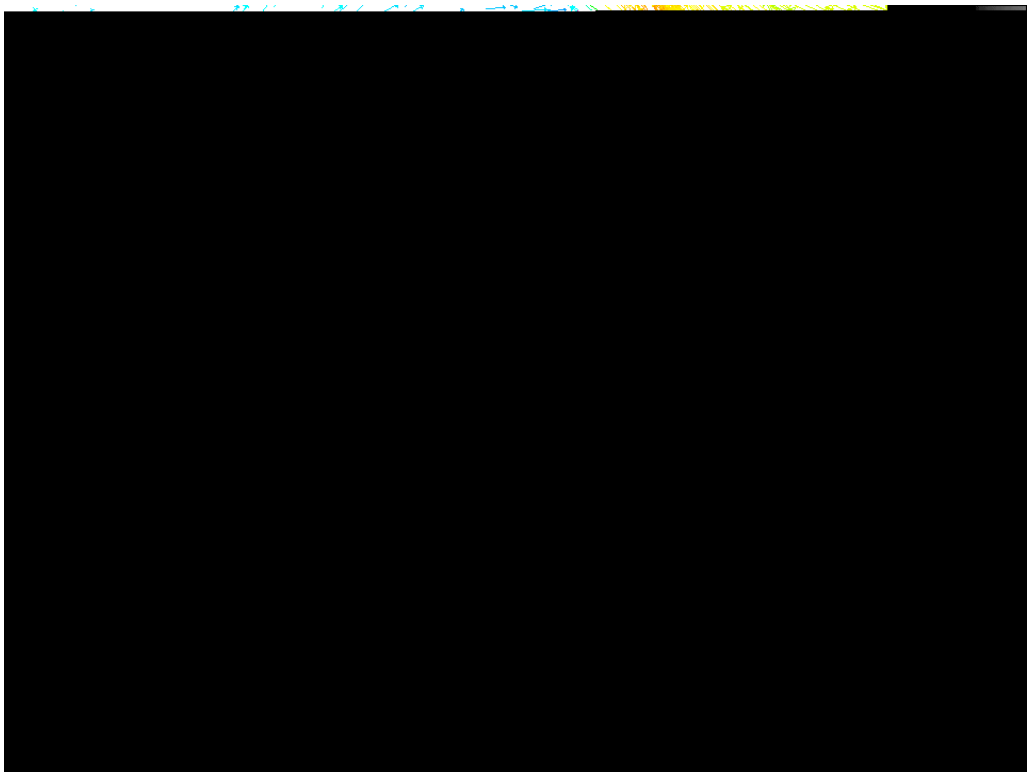
### 4.2.9 Bina modeli HM4 L oLQ DQDOL] VRQXoODUÕ

%LQD +0 PRGHOLQGH ELQD oDWÕVÕQGDNL JQHUÐHGSKHVLQGH ROGQ NX]H\ FHSKHVLQGHNL DoÕNOÕN2GVHDNUÕPLED6QÕN GSÕe]LV FHSKHOHULQGH EXOXQDQ EDFD YH SHQFHUH DoÕNOÕNODUÕ Y DoÕNOÕNODU +0 PRGHOLQGH +0 PRGHOL JLEL ELUD] NÕVÕOPÕ GXUXP Dncel]UHL œWLU %HOLULWLQHOHUGHOHVÕQHHQHQHSQ3DWV D\Õ YH NDOÕQOÕN GH¶-GHUHOLøLUWLOOPLœWL

#### 4.2.9.1 Bina modeli HM4 L oLQ KÕ] GD÷ÕOÕPODUÕ

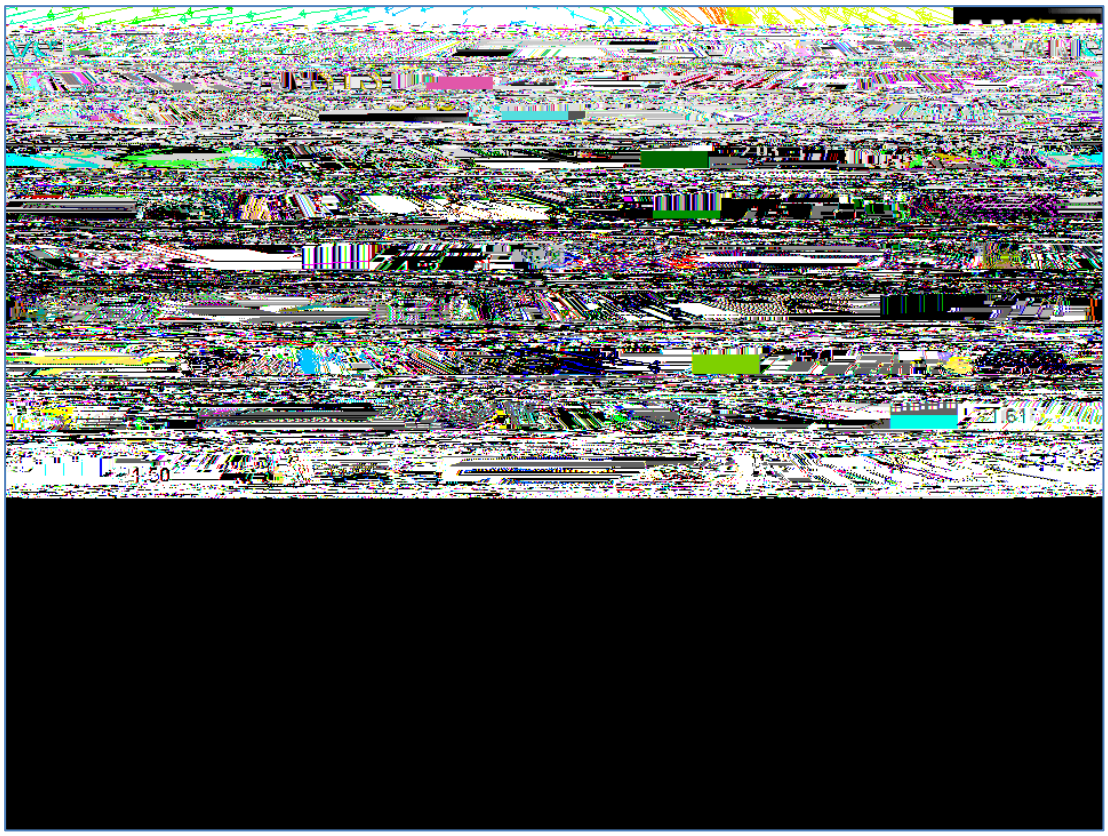
+0 PRGHOLQGH NX]H\ FHSKHVLQGHNL DoÕNOÕNODUGDQ JLUH P VQ LNHQ SHQFHUHOHULQ NÕVÕOPDVÕ LOHOEXœWXHU D] $\QÕœHNLOLQGHJ QH\ FHSKHVLQGHNL DoÕNOÕNODUGDQ JLUHQ K P VQ LNHQ SHQFHUHOHULQ NÕVÕOPDVÕ LOH EX GH÷HU D] m/sn ¶\H G œP BacW VUDN ÕVÕQGDNL taDoÕNOÕNODUÕQ WDODPD U ]JDU KÕ]Õ GH %38 azalarak 0,62 P VQ ¶GHQ VQ KÕ]D G œP ]deW JH dL ]HOJH

dL]HOJH ¶GH EHOLUWLOHQ VÕQÕU NRœXOODUÕYH dL]I
HOGH HGLOHQ VRQXoODUÕ øHNLOLDUDVÕQGD J|U OPHNWHGL

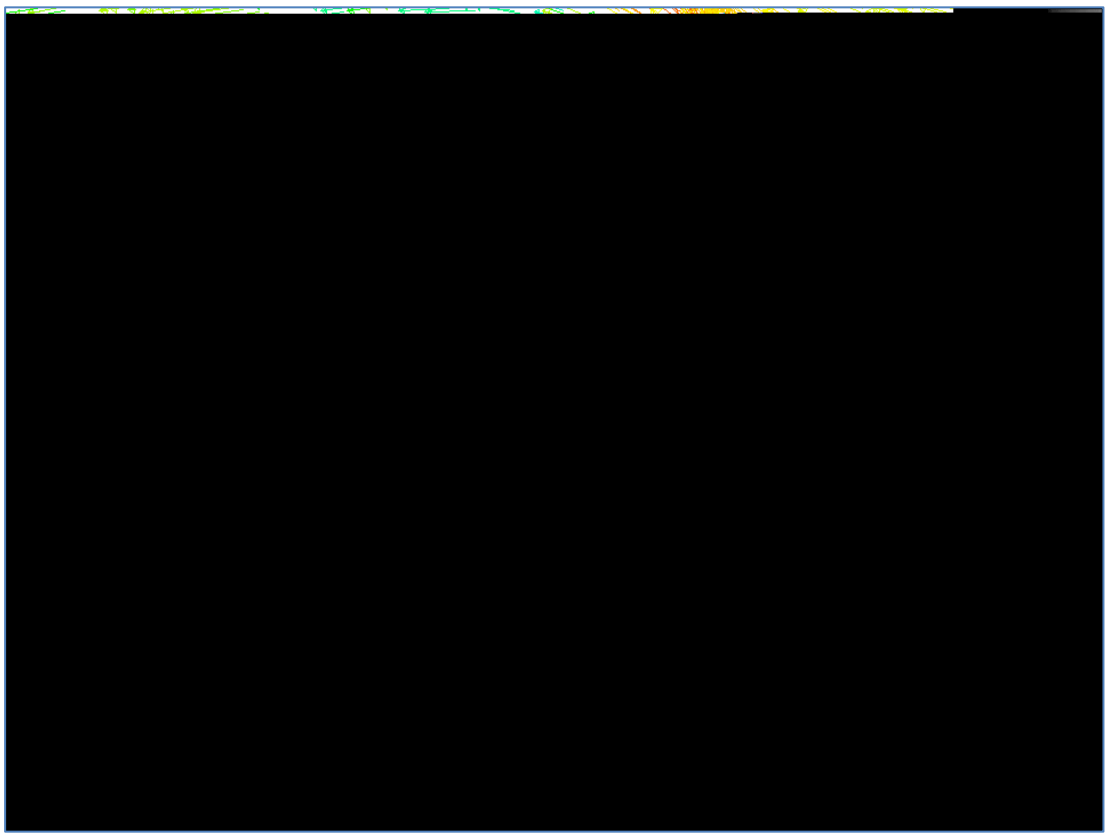


ùHNLO 3.3: Model HM4 LoKQG ]OHPLQGHNL YHNW|UHO KÕ GI

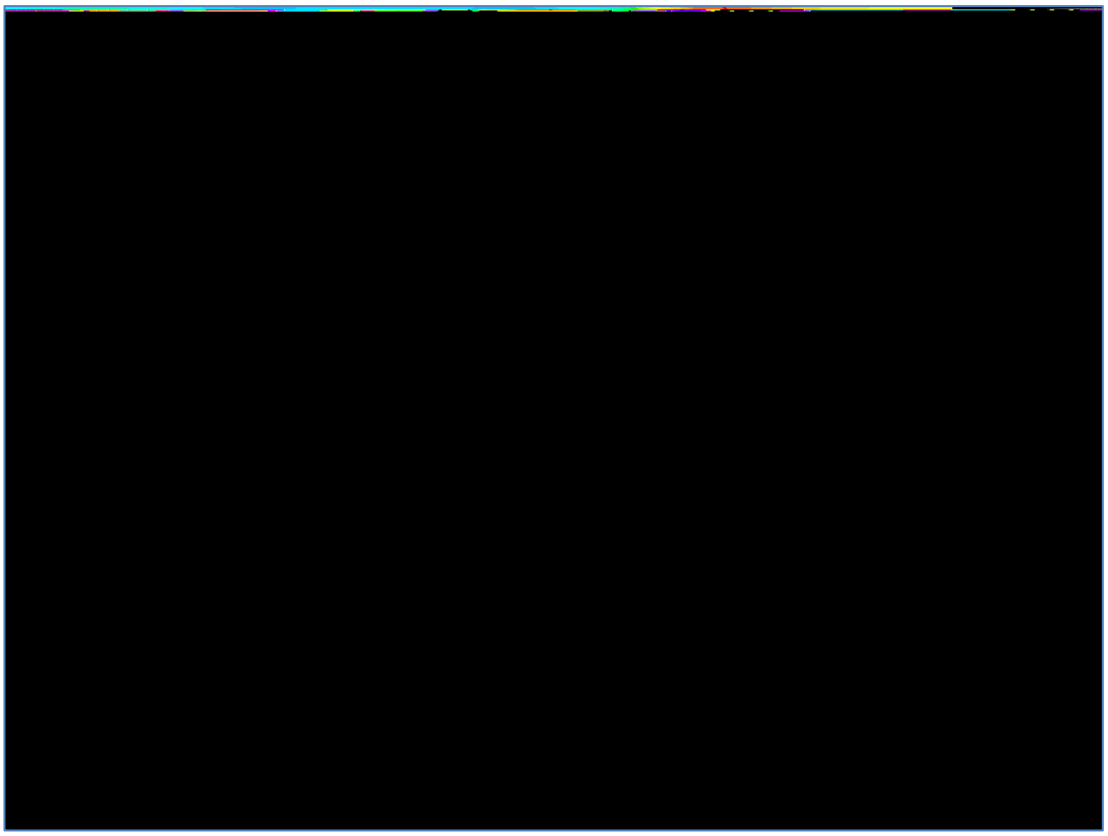
ùHNLO 3.4: Model HM4 LoKQG ]OHPLQGHNL YHNW|UHO KÕ GI



ùHNL115: Model HM4 LoŁQG ]OHPLQGHNL YHNW|UHO KÕ GDÑOÕ



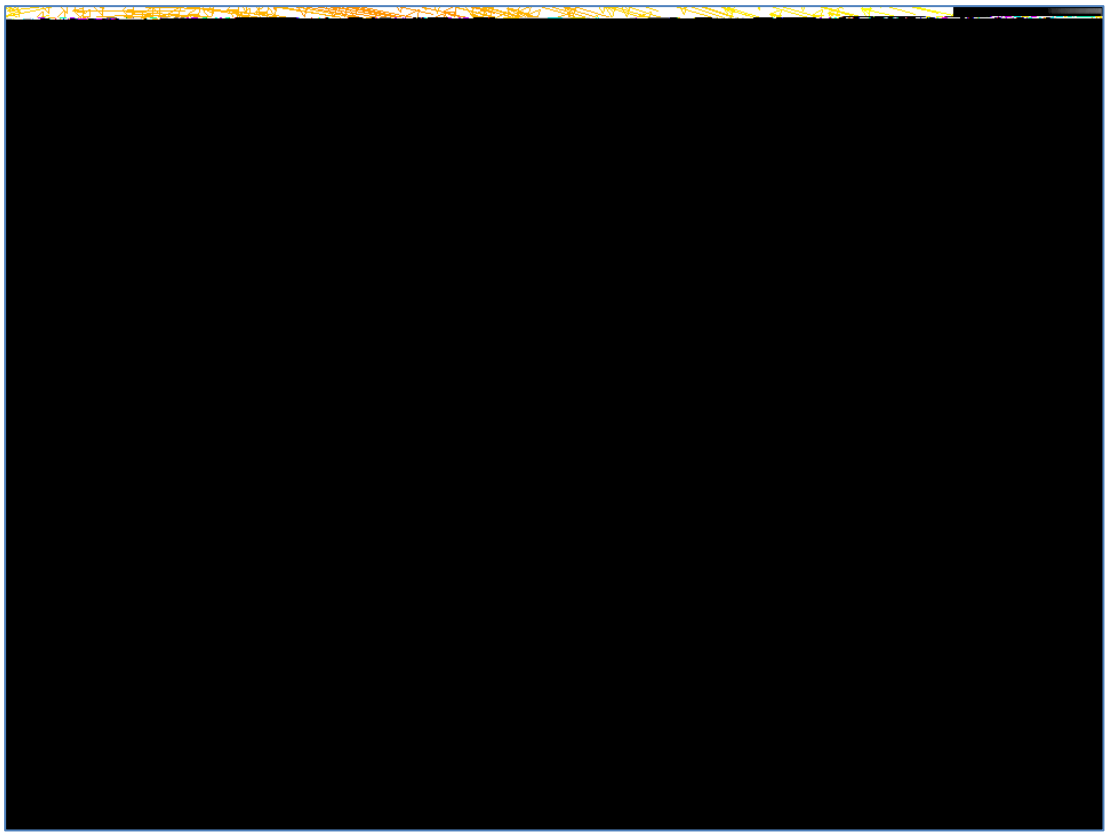
ùHNL116: Model HM4 LoŁQG ]OHPLQGHNLGYDHÑOWÕPÕHO KÕ



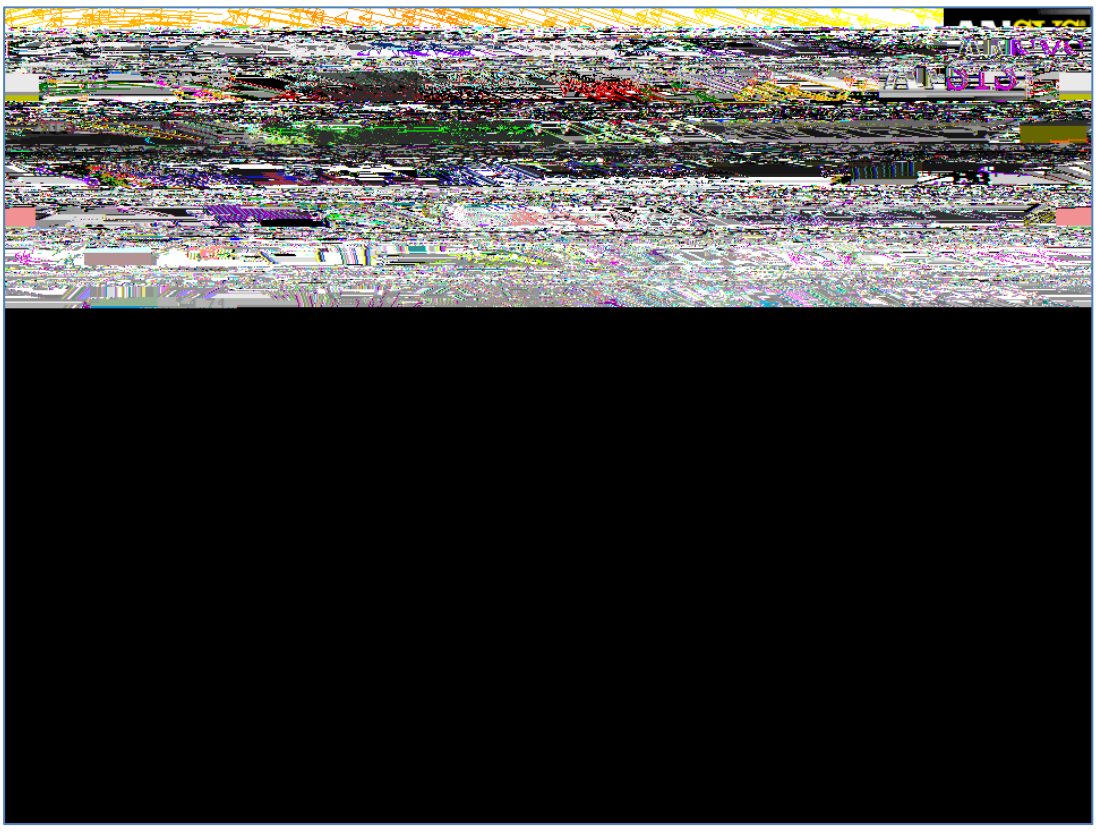
ù H N L107: Model HM4, Y2 G ] O H P L ( Q G H N D L ÷ Õ O Õ P Õ Q Õ Q N R Q W X U R O D U



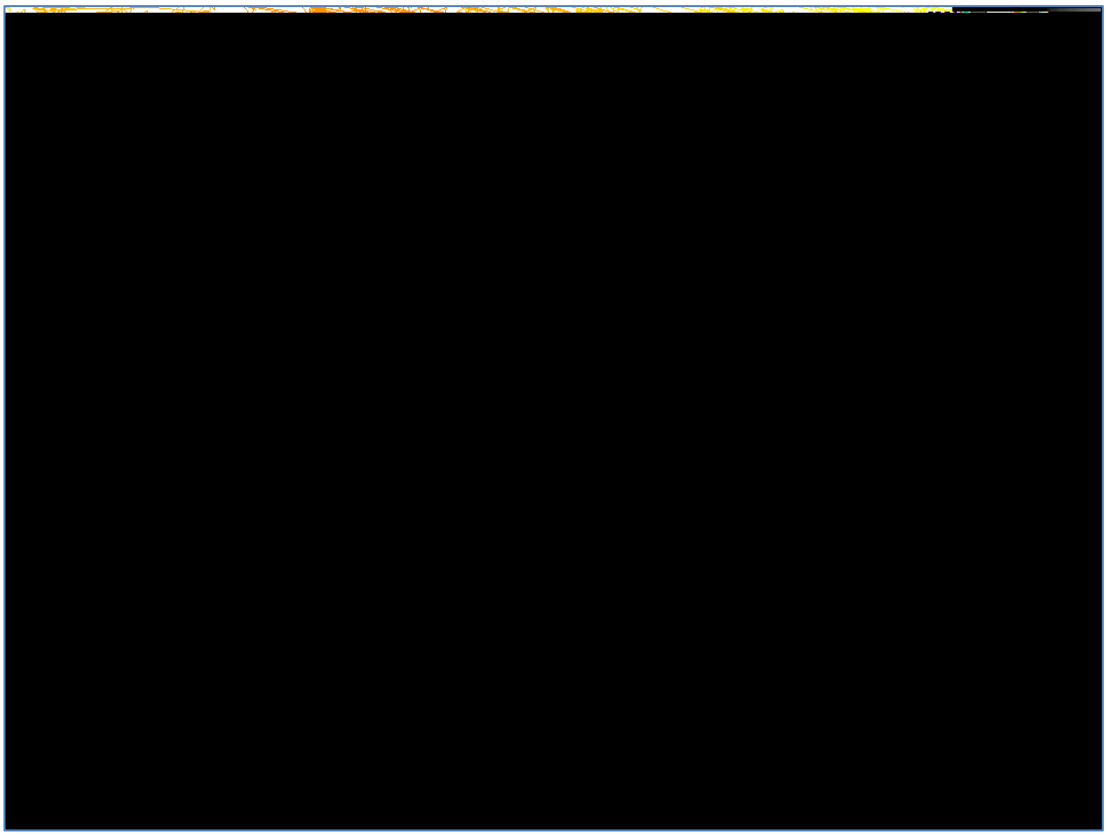
ù H N L108: Model HM4, Y4 G ] O H P L ( Q G H N D L ÷ Õ O Õ P Õ Q Õ Q N R Q W X U R O D U



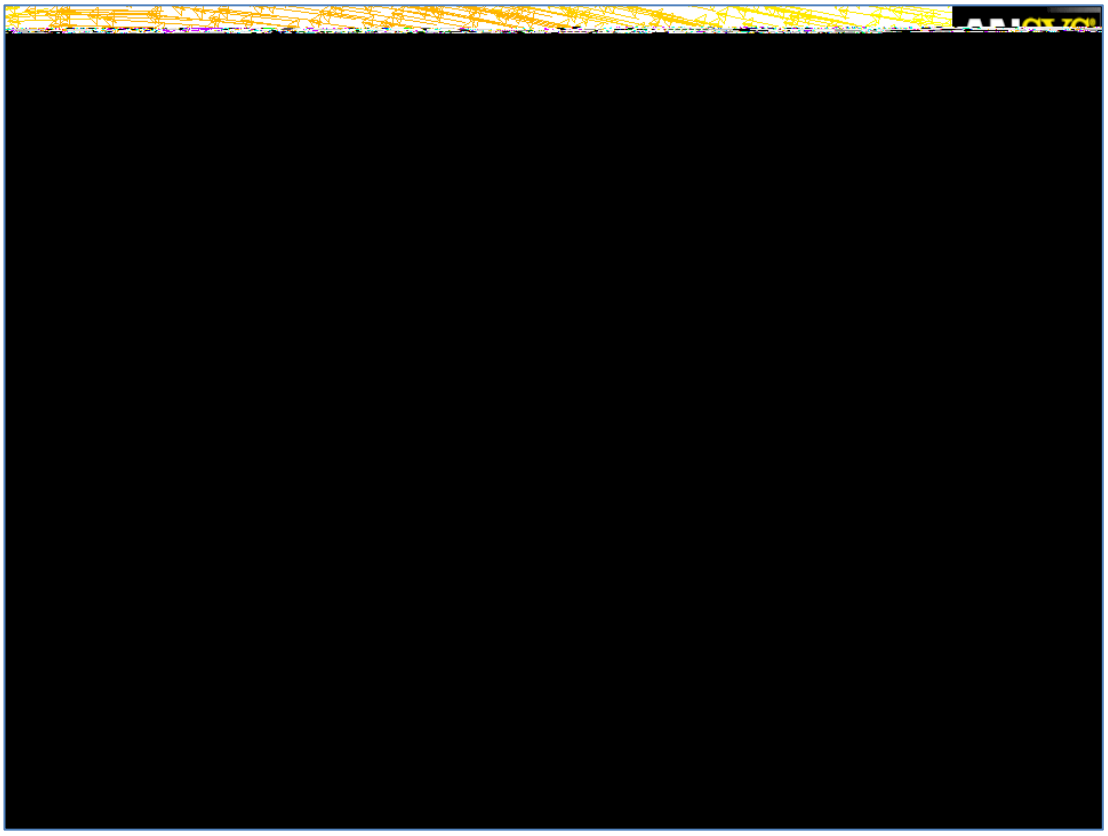
ùHNL19: Model HM4 LoDQG ]OHPLQGHNL YHNW|UHO KÕ GD÷ÕOÕP



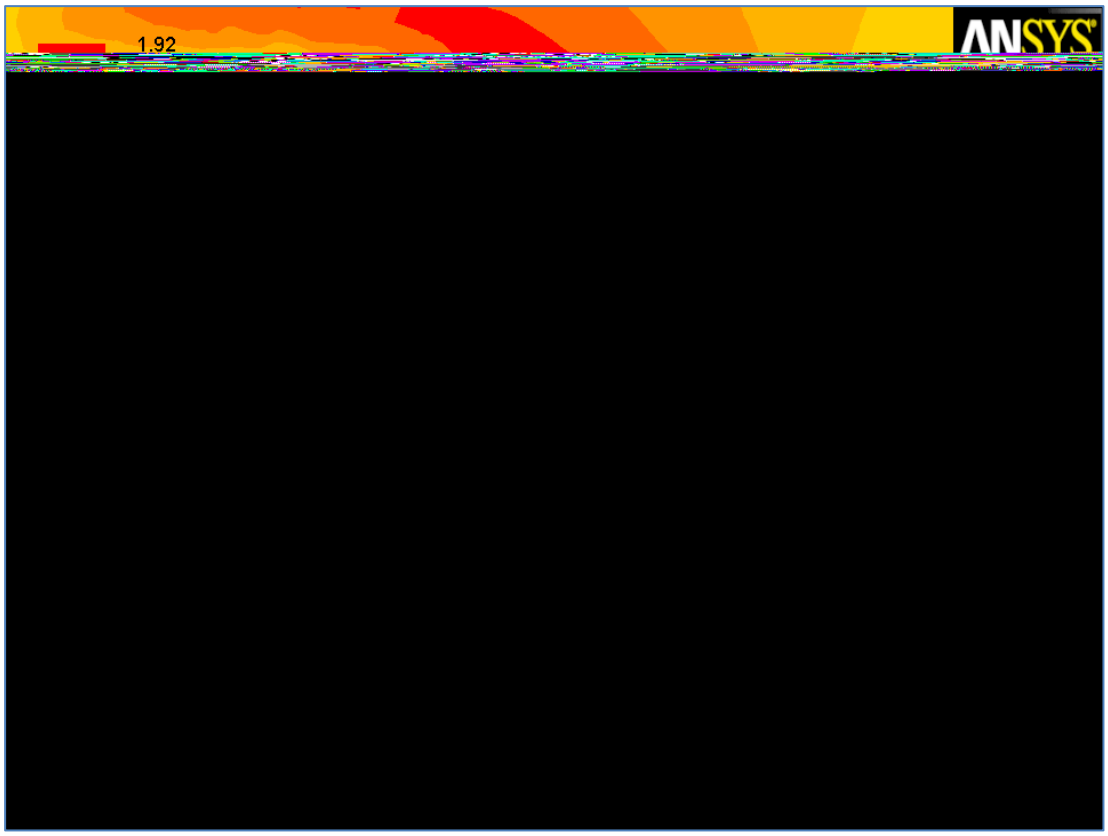
ùHN4.20: Model HM4 LoLQ ’ G ]OHPLQGHNL YHNW|UHO KÕ GD÷



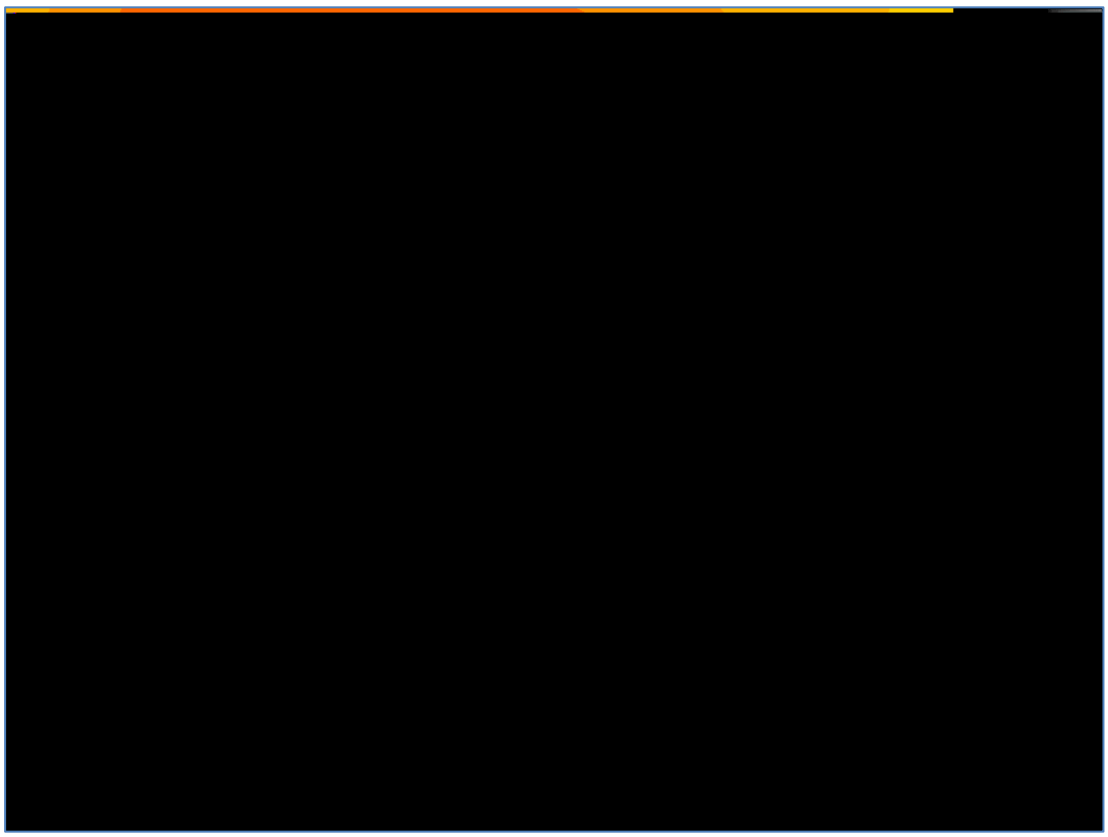
ùHNL121: Model HM4 LoLQ ’ G ]OHPLQGHNL YHNW|UHO KÕ



ùHNL122: Model HM4 LoLQ ’ G ]OHPLQGHNL YHNW|UHO KÕ




ùHNL23: Model HM4, ’ G ]OHPLQGHDÑOÕPÕQÕQ NRQWXU RODUDN J|VV



ùHNL24: Model HM4, ’ G ]OHPLQGHNL KÕ] GD÷ÕOÕPÕQÕQ NRQWXU ROD

dL]HOHQ %LQD PRGHO +0 LoLQ J QH\ FHSKHVLQGHNL SHQFHUHOHUGHQ JLUHQ Y

| | %LQD *QH\ &HSKHVLQGHNL 3HQFHUHOHULQ | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Kat 1 | +ÕG P V | Kat 2 | +ÕG P V | Kat 3 | +ÕG P V | Kat 4 | +ÕG P V |
| udf1l1 | 0,19 | udf2l1 | 0,26 | udf3l1 | 0,34 | udf4l1 | 0,42 |
| udf1l2 | 0,28 | udf2l2 | 0,33 | udf3l2 | 0,37 | udf4l2 | 0,42 |
| udf1l3 | 0,28 | udf2l3 | 0,30 | udf3l3 | 0,35 | udf4l3 | 0,42 |
| udf1l4 | 0,26 | udf2l4 | [redacted] | udf3l4 | 0,36 | udf4l4 | 0,40 |
| uwf1l1 | 0,28 | uwf2l1 | 0,19 | uwf3l1 | 0,25 | uwf4l1 | 0,34 |
| uwf1l2 | 0,19 | uwf2l2 | 0,23 | uwf3l2 | 0,27 | uwf4l2 | 0,33 |
| uwf1l3 | 0,18 | uwf2l3 | 0,25 | uwf3l3 | 0,27 | uwf4l3 | 0,33 |
| uwf1l4 | 0,19 | uwf2l4 | 0,22 | uwf3l4 | 0,29 | uwf4l4 | 0,32 |
| Ortalama | 0,23 | | | | | | |

### 4.2.9.2 %LQD PRGHOL +0 LoLQ EDVÕQo GD÷ÕOÕPODUÕ

HM4 0RGHOL LoLQ WDQÕPODQPÕœ G ]OHPOHUGHNL EDVÕQo olarak øHNL125 – øHNLO ¶&GJ|VWHULOPLœWLU $\UÕFD DoÕNOÕ EDVÕQo GD÷ÕOÕPODUÕdL]LHHOHH dL]HHOYJHUL.ÕuÆeyœWLU FHSKHVLQGHNL DoÕNOÕN \]H\OHULQGHNL RUWDODPD ED DoÕNOÕNODUÕQGDNL RUWDODFDLYDVÕQÕQGDGÕU S÷DVYFDQÕQ GR÷UXOWXVXQGD EDVÕQo JLGHUHN G œPHNWHGLU %LQ DoÕNOÕNODUÕQ NDWODUD J|UH GD÷ÕOÕPÕQGDNL 40 VÕQo GH dL]HOJH VWR÷UDXWOÕNÕGÕNoD EÕUÕQHÇÕQD\QHÖPNDQOÕ J|U OPHNWHGLU +0 0RGHOL +0 PRGHOL LOH NDUœÕODo \]H\LQGHNL EDVÕQo GH÷LœLPL RUWDODPD SDVFDO¶G

.X]H\ FHSKHVLQGHNL DoÕNOÕN \]H\OHULQGHNDL¶EDVÕQo G SDVFDO¶D J]H\ FHSKHVLQGHNL DoÕNOÕNLP]HLVHU ortalama 0,87 pasc DO¶GDQ SDVFDO¶D GœPœWU 9HNW| LQFHOHQGL÷LQGH EDVÕQo YHNW|U GD÷ÕOÕPÕQÕ KÕ] YHNW J|U OPHNWHGLU



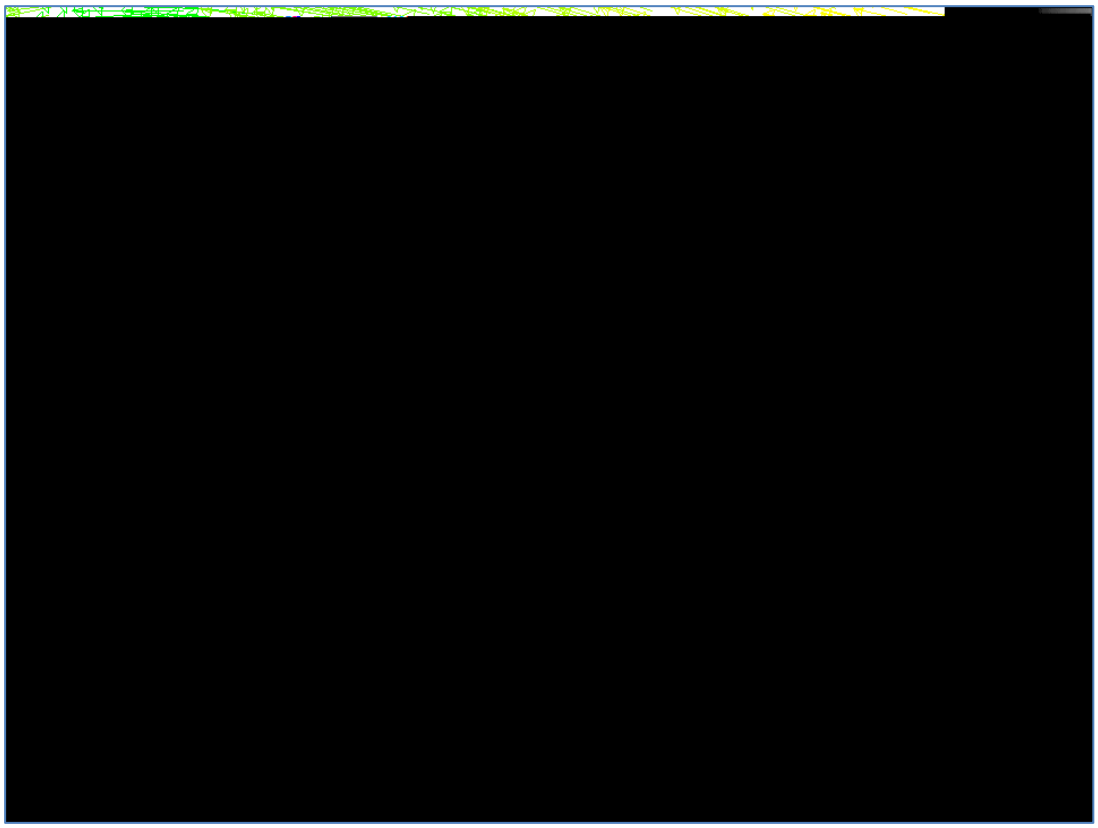
ùHM4.125: 0RGHO +0 <LoLQOHPLQGHNLEDVÕQ÷ÕQÕPÕO

ù H 4.1.26: 0 R G H O + 0 <L oGL Qo L Q

ù H M4.128:



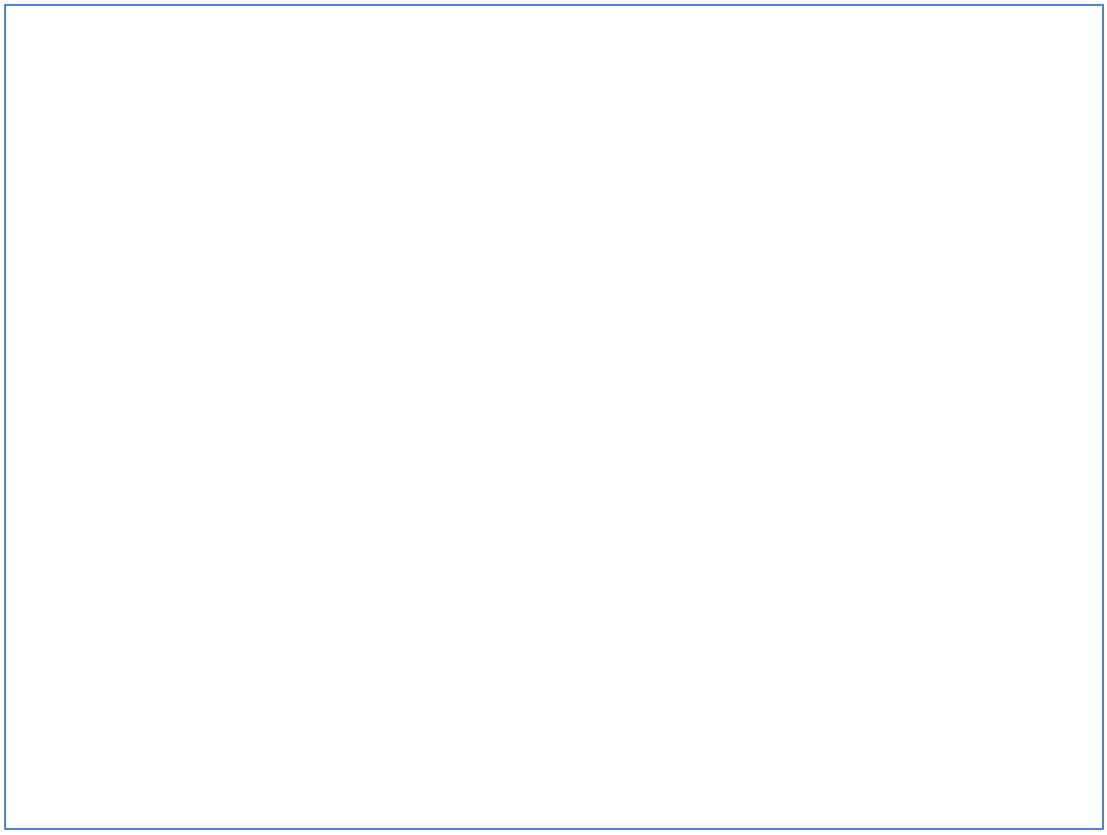

ùHM4.130: Model HM4, <G]OHPLEQDGVHQVLWLYLWHVLQ NRQWXURODUDN J|VWHULPL



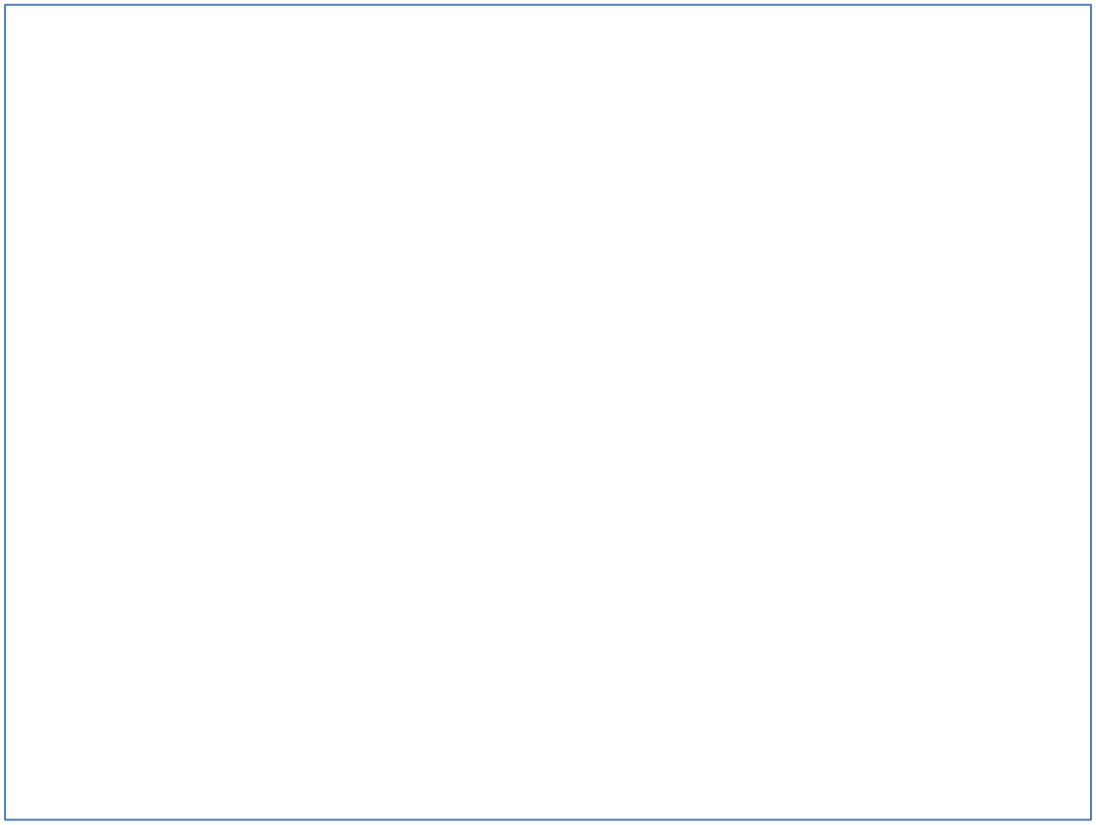
ùHM4.131: 0RGHO +0 ’L6LJQOHPLQGHNLDYEQDPLÇHO

ù H M4.1.32: 0 R G H O + 0 D L 6 L J Q H P L Q G H N E L D Y

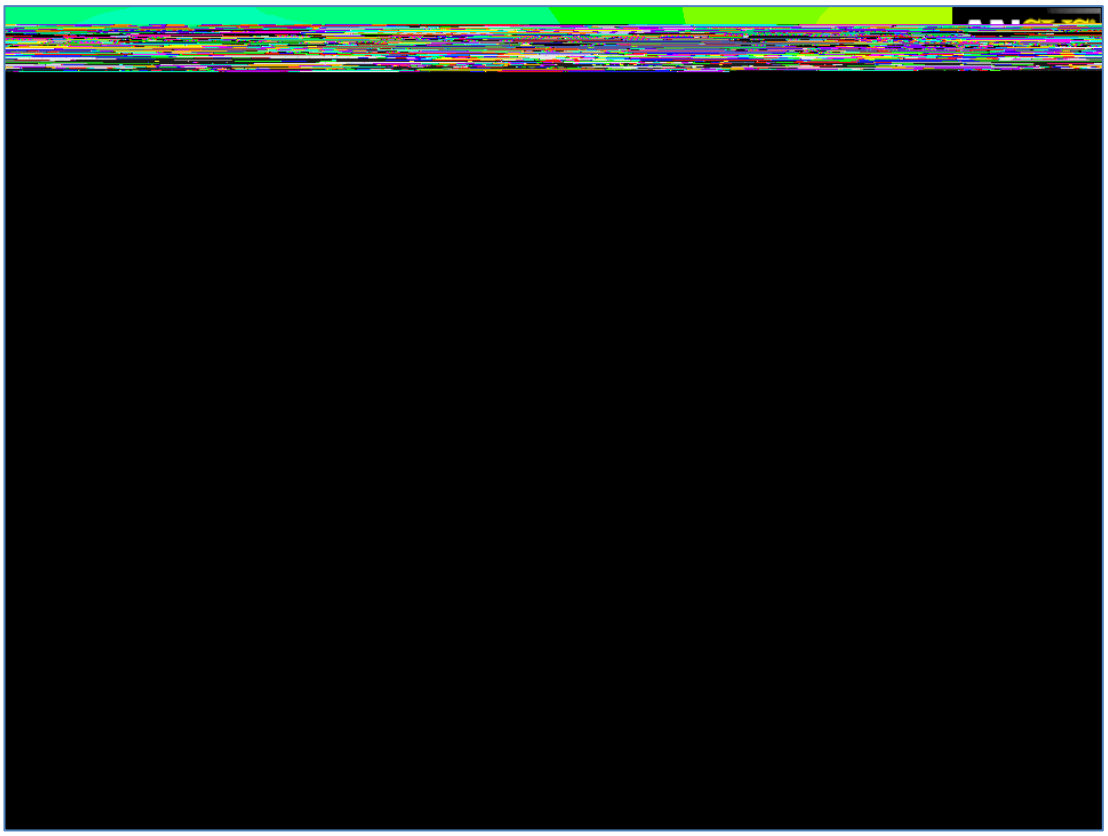
ù H M4.1.33: 0 R G H O + 0 L 6 L J Q H P L Q G H N E L D Y



ù H M4.134: 0 R G H O + 0 LG•]LQH'PLQGHNDVÕHQWÕ|OÕPÕ



ù H M4.135: Model HM4, ' G•]OHPLEQDVHÕNLOLÕ O Õ P Õ Q Õ Q N R Q W X U R O D U D N
J|VWHULPL



ùHM4.136: Model HM4, D4 G ]OHPLHQDWÕQGDNLQoÕPÕQÕQ NRQWXU RODUDN J|VWHULPL

dL]HO39H: %LQD PRGHO +0DNLQHQLQÕQEDVÕQGDNL EDVÕQo G

| 5 ]JD <|Q | 5 ]JL +ÕQÕ (m/sn) | %DFDGD %XOXQDQ$oÕNOÕNoÕQ EÖUGHNL 7DUDIÕ | P (pascal) |
|---|---|---|---|
| Kuzey | 1,5 | Kuzey - 6D÷ | 0,71 |
| | | * QH-Sol | -0,32 |
| Ortalama | | | 0,19 |

dL]HOHQHQ%LQD PRGHO +0 LoLQ NX]H\ FHSKHVLQGHNL SHQFHUHOHUGHNL E

| %LQD .X]H\ &HSKHVLQGHNL 3HQFHUHOHULQG | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kat 1 | P (pascal) | Kat 2 | P (pascal) | Kat 3 | P (pascal) | Kat 4 | P (pascal) |
| udf1r1 | 1,24 | udf2r1 | 1,31 | udf3r1 | 1,35 | udf4r1 | 1,20 |
| udf1r2 | 1,43 | udf2r2 | 1,50 | udf3r2 | 1,50 | udf4r2 | 1,22 |
| udf1r3 | 1,43 | udf2r3 | 1,49 | udf3r3 | 1,50 | udf4r3 | 1,21 |
| udf1r4 | 1,23 | udf2r4 | 1,29 | udf3r4 | 1,32 | udf4r4 | 1,16 |
| uwf1r1 | 1,56 | uwf2r1 | 1,61 | uwf3r1 | 1,60 | uwf4r1 | 1,31 |
| uwf1r2 | 1,75 | uwf2r2 | 1,77 | uwf3r2 | 1,72 | uwf4r2 | 1,30 |
| uwf1r3 | 1,74 | uwf2r3 | 1,76 | uwf3r3 | 1,71 | uwf4r3 | 1,30 |
| uwf1r4 | 1,54 | uwf2r4 | 1,58 | uwf3r4 | 1,56 | uwf4r4 | 1,28 |
| Ortalama | 1,49 | | 1,54 | | 1,53 | | 1,25 |

dL]HOHQHQ%LQD PRGHO +0 LoLQ J QHOHQHFHHUSKHHVLQGHNLE DVÕQo GH÷HUOHUL

| %LQD * QH\ &HSKHVLQGHNL 3HQFHUHOHULQG | | | | | | | |
|---|---|---|---|---|---|---|---|
| Kat 1 | P (pascal) | Kat 2 | P (pascal) | Kat 3 | P (pascal) | Kat 4 | P (pascal) |
| udf1l1 | 0,43 | udf2l1 | 0,42 | udf3l1 | 0,38 | udf4l1 | 0,38 |
| udf1l2 | 0,27 | udf2l2 | 0,29 | udf3l2 | 0,33 | udf4l2 | 0,33 |
| udf1l3 | 0,28 | udf2l3 | 0,34 | udf3l3 | 0,35 | udf4l3 | 0,35 |
| udf1l4 | 0,20 | udf2l4 | 0,28 | udf3l4 | 0,34 | udf4l4 | 0,34 |
| uwf1l1 | 0,45 | uwf2l1 | 0,37 | uwf3l1 | 0,28 | uwf4l1 | 0,18 |
| uwf1l2 | 0,22 | uwf2l2 | 0,23 | uwf3l2 | 0,21 | uwf4l2 | 0,15 |
| uwf1l3 | 0,25 | uwf2l3 | 0,29 | uwf3l3 | 0,25 | uwf4l3 | 0,16 |
| uwf1l4 | 0,15 | uwf2l4 | 0,21 | uwf3l4 | 0,24 | uwf4l4 | 0,21 |
| Ortalama | 0,28 | | 0,30 | | 0,30 | | 0,26 |

4.2.9.3 %LQD PRGHOL +0 LoLQ N•WOH GHQJHVL

$QDOL] LoLQ WDQÕPODQDQ DoÕNOÕNODUGDNL ÕKDYDODQ
KDYD PLNWDUÕ GH÷HUOHULQL NXOODQÕOPÕ¸WÕU

$oÕNOÕNODUÕQ GÜ]HQOHPHVL LoLQ GÖ÷UXGDQ GÖ÷UXOXNOD ÖOoÜOHQ KDYDQÕQ
+0 PRGHOLQH J|UH D]DOPÕ¸ WÕU ŁQFHOHPH |QFHOLNOH
NX]H\ FHSKHVLQGH \DSÕOPÕ¸ WÕU NX]JH\ FHSKHVLQGH KHU YDUGLNWL
D]DODUDN RUWDODPD NJ VQ¶GHQ 43 NJ VQ¶\H

verilerinde kuzey cephesindeki her bir katta bulunan ofislerdeki pencerelerdeki debi

GH÷HUOHULQGHQ \DUDUODQÕOPÕ¸WÕU %LQD PRGHOL +0 LoLQ EDFDGDQ JLUHQ YH oÕNDQ
GH÷HUOHUL D\UÕQWÕODUÕ RODUDN PHYFXWWXU * QH\ FHSKHVL
PLNWDUÕ D]DOGÕUDN RUWDODPD NJ VQ¶GHQ
EXOXQDQ DoÕNOÕNODUGDQ JHoHQ KDYD PLNWDUÕ LVH
3,7 NJ VQ¶\H G œP œW U

dL]HOJH4042H %LQD PRGHO +0 LoLQ EDFDGDQ JLUHQ YH oÕN

| 5 ]JL<br>< \|Q | 5 ]JL+ÕÇ<br>(m/sn) | %DFDGD %XOXQDQ $oÕNOÕNODUGDNL<br>%DFD $oÃ<br>7DUDIÕ | Debi (kg/s) |
|---|---|---|---|
| Kuzey | 1,5 | Kuzey - 6D÷<br>* QH-Sol | 3,72<br>0,00 |
| Toplam | | | 3,72 |

dL]H4043H%LQD PRGHO +0 LoLQ NX]H\ FHSKHVLQGHNL SHQFHUHOHUGHQ JLUHQ

| 5 ]JDU <|Q | 5 ]JDU +ÕIÕ (m/sn) | Bina Kuzey &HSKHVLQGHNL 3HQFHUHOHULQGHNL | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Kat 1 | Debi (kg/s) | Kat 2 | Debi (kg/s) | Kat 3 | Debi (kg/s) | Kat 4 | Debi (kg/s) |
| KUZEY | 1,5 | udf1r1 | -0,64 | udf2r1 | -0,61 | udf3r1 | -0,54 | udf4r1 | -0,37 |
| | | udf1r2 | -0,71 | udf2r2 | -0,68 | udf3r2 | -0,61 | udf4r2 | -0,38 |
| | | udf1r3 | -0,72 | udf2r3 | -0,68 | udf3r3 | -0,61 | udf4r3 | -0,38 |
| | | udf1r4 | -0,63 | udf2r4 | -0,59 | udf3r4 | -0,53 | udf4r4 | -0,34 |
| | | uwf1r1 | 0,64 | uwf2r1 | 0,61 | uwf3r1 | 0,54 | uwf4r1 | 0,37 |
| | | uwf1r2 | 0,71 | uwf2r2 | 0,68 | uwf3r2 | 0,61 | uwf4r2 | 0,38 |
| | | uwf1r3 | 0,72 | uwf2r3 | 0,68 | uwf3r3 | 0,61 | uwf4r3 | 0,38 |
| | | uwf1r4 | 0,63 | uwf2r4 | 0,59 | uwf3r4 | 0,53 | uwf4r4 | 0,34 |
| Toplam | | | 0,00 | | 0,00 | | 0,00 | | 0,00 |

dL]H4O44H%LQD PRGHO +0 LoLQ J QH\ FHSKHVLQGHNL SHQFHUHOHUGHQ JLUHQ

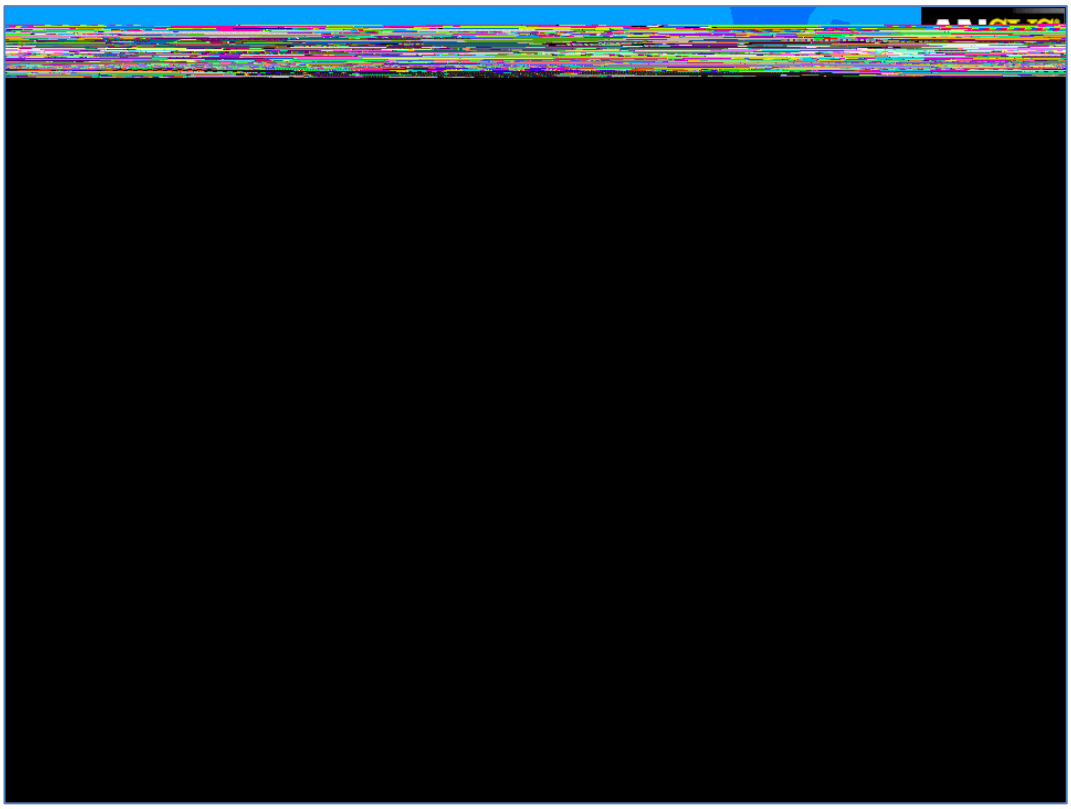
| 5 ]JDl <\|Q | 5 ]JDl +Qj Õ (m/sn) | Bina * QH\ &HSKHVLQGHNL 3HQFHUHOHULQGHNL | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Kat 1 | Debi (kg/s) | Kat 2 | Debi (kg/s) | Kat 3 | Debi (kg/s) | Kat 4 | Debi (kg/s) |

4.2.9.4 Bina modelHM4 L o LVQÕ F D N O Õ N G D ÷ Õ O Õ P O D U Õ

$ Q D O L ] L o L Q X \ J X Ortalama QÕ FD]NDÕQ . R U W D O D P D K Õ]

m/sn Y H K H U R G D G D E X O X Q D Q U D G \ D W ² U R O H U L Q N Õ V Õ Õ Q P Õ G W ¬ H U L

d L ] H O J H ¶ G H E H O L U W L O H Q G ] O H P O H U L J ² U H N O H H G L O H



ù H M4.138: Model HM4, Y2 G ]OHPLQGHNLOÕPÕQÕQ NRQWXU RODU
J|VWHULPL



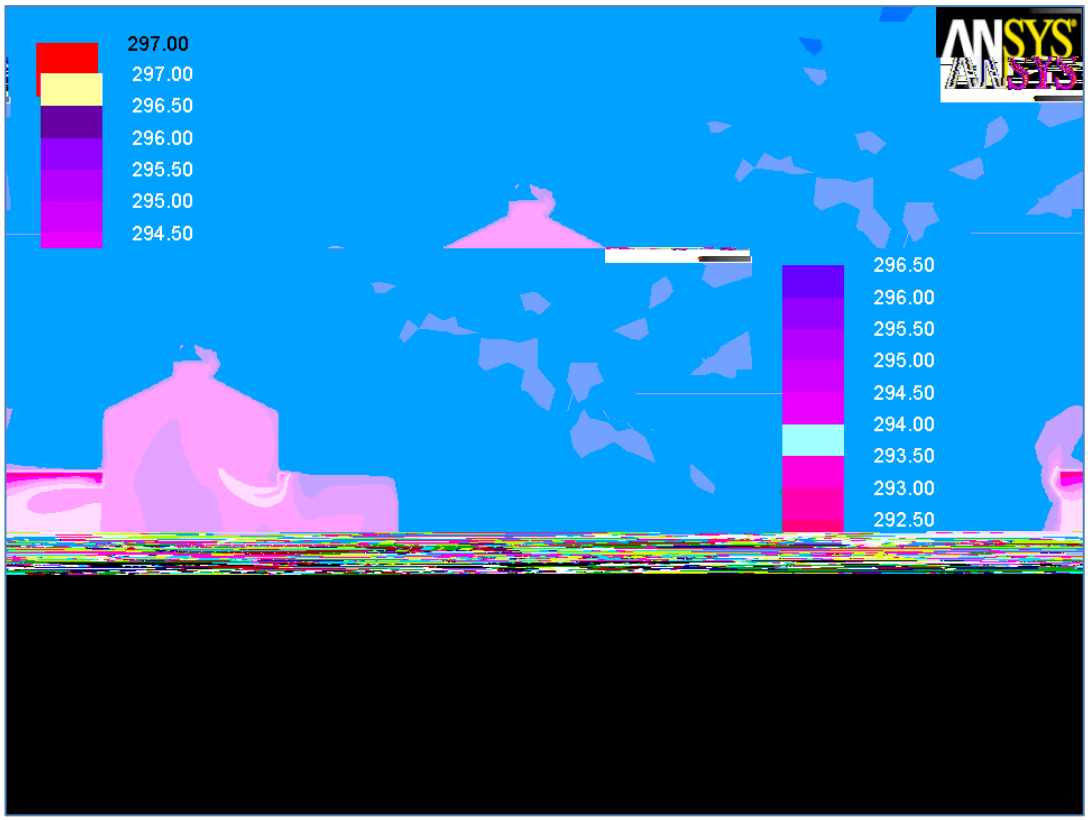
ù H M4.139: Model HM4, Y3 G ]OHPLQGHNLOÕPÕQÕQ NRQWXU RODU
J|VWHULPL



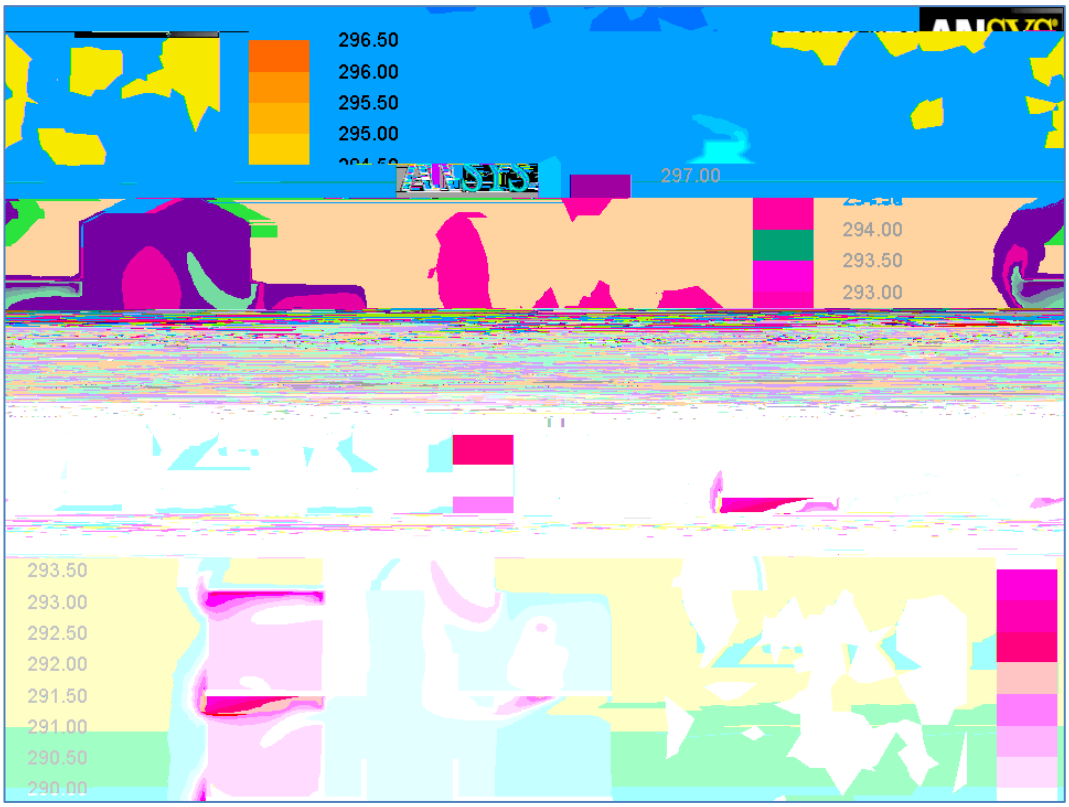

ù H M4.140: Model HM4, Y4 G ]OHPLVÕGHDNLOÕQÕQ NRQWXU RODUDN J|VWHULPL



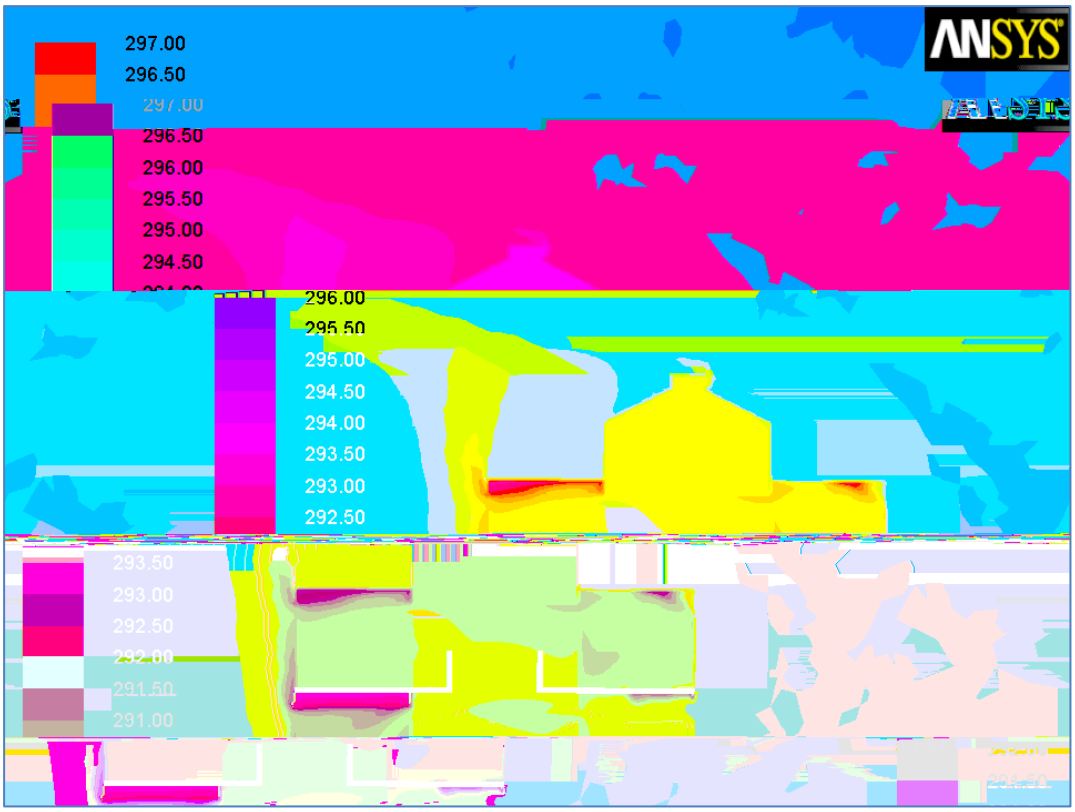

ù H M4.141: Model HM4, D1 G ]OHPLVÕGHDNLOÕQÕQ NRQWXU RODUDN J|VWHULPL




ù H M4.142: Model HM4, D2 G ]OHPLQGHDNLOEÕPÕQÕQ NRQWXU RODUD
J|VWHULPL




ù H M4.143: Model HM4, D3 G ]OHPLQGHDNLOEÕPÕQÕQ NRQWXU RODU
J|VWHULPL




ù H M4.142: Model HM4, D4 G ] O H P L QÕ GH NL OHÕP QÕQ N R Q W X U R O D U D N J | V W H U L P L

## 5. 6218d9( g1(5ø/(5

<DSÕODQ EX oDOÕœPD NDSVDPÕQGD JHRPHWULVL EHOI
KDYDODQHGWÕNODQOL÷L KHVDSODPDOÕ DNÕœNDQODU GLQD
EHOLUOHQPÕVWLU VRQUDVÕQGDNL, KoÕ YGH÷
VÕFDNÕN GYHI÷LDNÕPLoL]JLOHUL LQFHOHQPLœWLU

7H] NDSVDPÕQGD ELU ELQD PRGHOL WDVDUODQPÕœWÕU
ELULPGHQ RGD ROXœPDNWDGÕU 0HWHRURORMLN *HQHO
*|]WHSH EL|OLHVLQLQ VDOÕQÕPÕQ U ]JDU KÕ \|Q YH VÕFDNÕN G
HaNLP RODQ U ]JDU \QQDUWHPRWDOÕPD VÕFDNÕN YH
HGLOPLœWLU

$QDOL]L \DSÕODQ ELQD PRGHOL LoLQ ELQVÕFNÕVÕÕN DU
GD÷ÕOÕPÕQVÕKÕ GD÷ÕOÕPÕWODUÕQÕF HOHQPLœOLU VXHQVXRQXœW

dL]HOJH ¶GH \DSÕPRGHOL LoLQ EHOLUOHQHQ DQDOL]
U ]JDU \|Q QH J|UH DoÕNOÕNODUÕQ GXUXPODUÕQÕ EHOLU
GXUXPD J|UH HM3 modelleri ile, HM2 ve HM3 modelleri benzerlik
J|VWHUPHNWHGLU )DUN RODUDN DoÕNOÕNODUÕQ WDP Y
IDUNOÕGÕUODU

5 ]JDUÕQ EHOLUOL \|QGH HVPHVL VRQXFXQGD U ]JDU
\ ]HOHULQH oDUSDÕODÕNODEHUGDQOLoHUL\H JLUGL÷L YH EL
ELQDQÕQ N|œHOHULQGWHUUHPWWLd÷DWÕUVHEHPHNWHGLU \
U ]JDU KÕ]ODUÕPH\GDQD JHOPHMHWHDRQDGXHXHVQSWDQÕOPÕ
KÕ]ODUÕ GXYDUODUÕQ \DNÕQÕQoRNDXNDÕPÕQÕVÕÕQDUÕQGD
EDVÕQoODUD \RO DoWÕ÷ÕJ|]OHPOHQPLœWLU

%LQDQÕQ U ]JDUÕQ JLGLœ \|Q QGHNL GXYDUÕQGD \ NVI
JHOPLœWLU $\UÕFD EX GXYDUD HWNL HGHQ KÕ U ]JD
GH÷HULQGHQ NGWDKD ’GL÷HU ELU \DQGDQ ELQDQÕQ J QH\
GH÷LœLPLQGHQ ND\QDNOÕ\XNDUÕGR÷UX ELU DNÕœ PH\GD

0H\GDQD JHOHQ EX E|OJH JHUL G|Q œ E|O6HRVL RODDUDN DGO
J|UH KDEDQDÕHWHWLN÷L J QH\UFHJSDKHYKÕQÕGaha]aJDUÕQÕ÷Õ
kuzey cephesindeki U ]JDU KÕ]Õ0alama|%5H-60 daha D] ROG|XU÷XOP œW U

HM3 ve HM4 DQDOL]OHULQGH LVH SHQFHUH YH EDFD DoÕNOÕNO
DoÕNOÕNODU J|]HQHNOL RODUDN DQQOGHOH3HUDXVQXÕSWÕU
&RHIILFLHQW· YH ‡3RURXV 0HGLXP 7KLFNQHVV· GH÷HUOHUL
RUWDPÕQGDNL KÕVÕGDN÷ÕOÕPÕYH÷LdeNÕL oL]JLOHUL GH÷LœLPO
LQFHOHQPHVL GW÷HU \DSÕOPÕœ RODQeldeDeqDeOLJORHQXo0DH
NDUDGHWÕUÕGÕPÕDWÕQÕ DNÕœ \|Q GR÷UXOWXVXQGD EDVÕQo JL
|QFHOLNOH KDYDQÕQ LON RODUDN LoHUL\H JLUGL÷L NX]H\ FH
KDYD PLNWDUÕQÕQ RUWDODPD J QH\ FHSKHVLQGHNL SH
PLNWDUÕQÕQ GD IRQWDOHPDQÕQGD D]DOPÕœWÕU

5DG\DW|U Q EXOXQGX÷X \]H\OHUGH –RUW.DODEDVÕQGDNÕ
GH÷HUNHQ YH RGDODUGDNL RUWDODPE293VKÕFdaNÕ LoLQ EX
EXOXQPX÷DWXUVÕQÕQSHÕHUH HWNLVL\OH SHQFHUH\H \DNÕ
\ NselGL÷LYH SHQFHUHGHQ X]DNODœWÕNoD HRDYGX÷XVÕFDNÕ÷Õ
J|]OHPOH.QPLœWLU

dDOÕœPD NDSVDPÕQGD ELQD LoHULVLQGH HOGH HGLOHQ K
NXOODQÕODUDN X\JXQ LNOLP NRœXOODUÕ LoLTez KDYDODQGÕU
oDOÕœPDWDÕPÕQGDSDNEE2XÕOHU \DSÕPÕœWÕU %XQODUGDQ HQ |QH
\|Q YH KÕ]ÕNDEXO G U ’DKD VRQUD \DSÕPDVÕSODQODQDQ V
EX HWNLOHULQ EJX[DX|QGQXHKOPDVÕ GR÷DO KDYDODQGÕUPD
JHOLœPHVLQVHÕ÷NDWWÕÕEDNÕPÕQGDQ |QHPOLGLU

’L÷HU ELU \DQGDQ IDUNOÕ UDG\DW|U J oOHUL VLVWHPH VÕ
VÕFDNÕN GH÷ÕOÕPÕQÕQ LVWHQLOHQ VHYL\HGH ROXS ROPDG
RUDQÕQÕQ +’2 VD÷ODQÕS VD÷ODQPDGÕ÷ÕnedeiS.Õ6\UÕ÷DN oDOÕœPDO
WDVDUÕPÕ \DSÕODQ EX ELQD GÕœÕQGD IDUNOÕ JHRPHWULN
]HULDQGHNDÝDODQGÕUPD DoÕNOÕNODUÕQÕQ\OH EOHQGLQÕQR]LV\R
oHYUH ELQDODU DÇHDeQHÕUPWNRQXVXNRODUDN VHoLOHELOLU

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