McIDAS-X Software Development and Demonstration

Dave Santek and Jay Heinzelman
8 June 2015
Overview

• McIDAS-X 2014.1 & 2015.1

• McIDAS-XCD 2014.1

• Software development and plans for version 2015.2 and beyond…
McIDAS-X 2014.1 & 2015.1
ADDE Servers

- MSG rapid scan data
- COMS updates
- Prep for Landsat
- MODIS server enhancement for cloud top products
- Himawari AHI (2015.1)
MSG Rapid Scan
COMS ADDE Server

- Corrected line/element calculation with IMGCOPY commands
- Fixed directory server so –V can display COMS

```
IMGDISP TESTSET/COMS-FD BAND=1 LAT=0 -128
IMGCOPY TESTSET/COMS-FD A/A.1 BAND=1 SIZE=SAME
IMGDISP A/A.1 LAT=0 -128
```
Landsat preparation

- Currently use GDAL (Geospatial Data Abstraction Library) to read HDF file and reproject
- Convert to AREA using IMGMAKE
MODIS cloud top products

Cloud optical thickness
Himawari-8 AHI
McIDAS-X 2014.1 & 2015.1

Imagery

- IMG* commands updated for large files
- IMGREMAP SIZE=ALL improvement
- BAR updates when using SU tables
- AREA files can now be renamed w/o issue
IMG* commands for large files

• Increased the maximum number of pixels per line to 43200

IMGREMAP SIZE=ALL

• Improved cases when some pixels are off the Earth edge
BAR with SU=
McIDAS-X 2014.1 & 2015.1

Miscellaneous

• Navigation added for more GRIB files: UK Met office, NOMADS, Precipitable water
• GRDLIST fix for SFC/TRO level grids
• New installation flag for the GUI for building with Tcl/Tk 8.5 (8.4 is the default)
  o Issues with resizing and scrolling – 8.5
Navigation for GRIB files

UK Met Office, NOMADS, Precipitable water grids
GRDLIST fix for SFC/TRO level grids

<table>
<thead>
<tr>
<th>PAR</th>
<th>LEVEL</th>
<th>DAY</th>
<th>TIME</th>
<th>SRC</th>
<th>FHR</th>
<th>FDAY</th>
<th>FTIME</th>
<th>GRID</th>
<th>PRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>SFC</td>
<td>05 JUN 15156 12:00:00</td>
<td>GFS</td>
<td>24</td>
<td>06 JUN 15157 12:00:00</td>
<td>N/A MERC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>SFC</td>
<td>05 JUN 15156 12:00:00</td>
<td>GFS</td>
<td>48</td>
<td>07 JUN 15158 12:00:00</td>
<td>N/A MERC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>SFC</td>
<td>05 JUN 15156 12:00:00</td>
<td>GFS</td>
<td>48</td>
<td>07 JUN 15158 12:00:00</td>
<td>N/A MERC</td>
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<td></td>
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</tr>
</tbody>
</table>

Number of grids listed = 3
GRDLIST - done

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<th>FHR</th>
<th>FDAY</th>
<th>FTIME</th>
<th>GRID</th>
<th>PRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>TRO</td>
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<td>GFS</td>
<td>24</td>
<td>06 JUN 15157 12:00:00</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>TRO</td>
<td>05 JUN 15156 12:00:00</td>
<td>GFS</td>
<td>48</td>
<td>07 JUN 15158 12:00:00</td>
<td>N/A MERC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>TRO</td>
<td>05 JUN 15156 12:00:00</td>
<td>GFS</td>
<td>48</td>
<td>07 JUN 15158 12:00:00</td>
<td>N/A MERC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>TRO</td>
<td>05 JUN 15156 12:00:00</td>
<td>GFS</td>
<td>48</td>
<td>07 JUN 15158 12:00:00</td>
<td>N/A MERC</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number of grids listed = 4
GRDLIST - done
McIDAS-XCD 2014.1

- RTGRIDS updates:
  - New models and parameters
  - New and deleted datasets
- PIREP decoder fixes and enhancements
- STNDB.CORE updates
  - Hundreds of stations added for PIREP reports
  - New TAF and MOS stations
  - Other minor corrections
RTGRIDS

New models

• WRF (Weather Research and Forecasting Model)
• NMMB (Non Hydrostatic Multiscale Model)
• URMA (Unrestricted Mesoscale Analysis)
RTGRIDS
New parameters

• Fire weather parameters
• Relative humidity wrt precipitable water
• Momentum parameters
• Forecast radar parameters
RTGRIDS

New datasets

- URMA-USLCDRS1
- URMA-USLCDRS2
- WRF-USLCSW
- WRF-PRME (Puerto Rico)
- RCM-EPME (Eastern Pacific)
- RCM-WAME (Western Atlantic)
- RCM-SWPME (Southwest Pacific)
- RCM-SCPME (South central Pacific)
- RCM-HIME (Hawaii)
- RCM-NEPME (North east Pacific)
- RCM-SAME (Southern Arctic)
- RCM-NAME (North Atlantic)
- RCM-NWPME (Northwest Pacific)
- RCM-NCPME (North Central Pacific)
- NMMB-FIRELONT (Lake Ontario)
- NDF-USLCAWI4
RTGRIDS
GRIB1 datasets removed

- GFS-AKPS
- GFS-AKPSLRES
- GFS-AKPSSSIF
- GFS-GLMELRES
- GFS-HIMELRES
- GFS-HIMESSIF
- GFS-NHPSLRES
- GFS-NHPSSSIF

- GFS-NWME170
- GFS-USPSLRES
- GFS-USPSSSIF
- WWF-GLME
- RAP-USLC
- RAP-USLC3
- RAP-USPS
PIREP/AIREP in XCD

• Improvement to decoding icing and turbulence categories (moderate, extreme, light, etc.)
• Better handling of stations and OV field (location of reports)
• Better decoding of Canadian flight information regions
ADVDisp (-XRD)
ADDE Servers currently in testing

- Kalpana HDF5
- INSAT 3D
- Native format MSG L1.5
- Update FSD (LRIT) for current GOES and Meteosat satellites
Kalpana HDF5 server
Native MSG L1.5 server (MSGS)
FSD (LRIT) server update

- GOES15, GOES13, MET7, MTSAT2

<table>
<thead>
<tr>
<th>Group/Descriptor</th>
<th>Type</th>
<th>Format &amp; Range</th>
<th>RT Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>FSD/MET7</td>
<td>IMAGE</td>
<td>FSDX</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>DIRFILE=/home/mcuser/inquiry-data/mcidas-x/15564/MET7/*</td>
<td></td>
</tr>
</tbody>
</table>

DSSERVE: done
Currently in testing – Grid, point, misc.

- FRANGE= keyword bug fix
- GRDLIST with LEV= using [MB] & [HPA]
- Access to large grids
- UACROSS with more that 100 levels
- LFC/LCL, Precipitable water calculation adjustments for UA* commands
- PTLIST computed parameters with missing values
- STNDB.CORE updated GFS/NAM MOS stations
- mctext fix to prevent crashing (JSC)
FRANGE= bug fix

• When you request too many FHOURLs, you will get an informative error message

---------
ECHO "THE OLD CODE"
THE OLD CODE
GRDLIST RTGRIDS/GFS-USLC DAY=2015156 TIME=0 PAR=PCP NUM=ALL FRANGE=12 72
GRDLIST: Server error -4 in Database query
GRDLIST - done
ECHO "THE NEW CODE"
THE NEW CODE
GRDLIST RTGRIDS/GFS-USLC DAY=2015156 TIME=0 PAR=PCP NUM=ALL FRANGE=12 72
GRDLIST: Too many FHOURLS in request
GRDLIST - done
GRDLIST RTGRIDS/GFS-USLC DAY=2015156 TIME=0 PAR=PCP NUM=ALL FRANGE=12 72 & Dataset position 1 Directory Title= /GFS.96.2015156.0.72.211.grib

<table>
<thead>
<tr>
<th>PAR</th>
<th>LEVEL</th>
<th>DAY</th>
<th>TIME</th>
<th>SRC</th>
<th>FHR</th>
<th>FDAY</th>
<th>FTIME</th>
<th>GRID</th>
<th>PRO</th>
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<tbody>
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<td>08</td>
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<td>00:00:00</td>
<td>GFS</td>
<td>66</td>
<td>07</td>
<td>JUN 15158</td>
<td>18:00:00</td>
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<td>JUN 15157</td>
<td>06:00:00</td>
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<td>00:00:00</td>
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<td>24</td>
<td>06</td>
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<tr>
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<td>12</td>
<td>05</td>
<td>JUN 15156</td>
<td>12:00:00</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Number of grids listed = 11
GRDLIST - done
GRD* commands with LEV= using [MB] & [HPA]

Old Server
GRDLIST RTGRIDS/GFS-GLME1POD DAY=157 TIME=12 PAR=U LEV=300[MB]
GRDLIST: No grid found matching search conditions
GRDLIST - done
GRDLIST RTGRIDS/GFS-GLME1POD DAY=157 TIME=12 PAR=U LEV=300[HPA]
Dataset position 1

<table>
<thead>
<tr>
<th>PAR</th>
<th>LEVEL</th>
<th>DAY</th>
<th>TIME</th>
<th>SRC</th>
<th>FHR</th>
<th>FDAY</th>
<th>FTIME</th>
<th>GRID</th>
<th>PRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>300 HPA</td>
<td>06 JUN 15157</td>
<td>12:00:00</td>
<td>GFS</td>
<td>384</td>
<td>22 JUN 15173</td>
<td>12:00:00</td>
<td>N/A</td>
<td>MERC</td>
</tr>
</tbody>
</table>

Number of grids listed = 1
GRDLIST - done

New Server
GRDLIST RTGRIDS/GFS-GLME1POD DAY=157 TIME=12 PAR=U LEV=300[MB]
GRDLIST RTGRIDS/GFS-GLME1POD DAY=157 TIME=12 PAR=U LEV=300[HPA]
Dataset position 1

<table>
<thead>
<tr>
<th>PAR</th>
<th>LEVEL</th>
<th>DAY</th>
<th>TIME</th>
<th>SRC</th>
<th>FHR</th>
<th>FDAY</th>
<th>FTIME</th>
<th>GRID</th>
<th>PRO</th>
</tr>
</thead>
<tbody>
<tr>
<td>U</td>
<td>300 MB</td>
<td>06 JUN 15157</td>
<td>12:00:00</td>
<td>GFS</td>
<td>0</td>
<td>06 JUN 15157</td>
<td>12:00:00</td>
<td>N/A</td>
<td>MERC</td>
</tr>
</tbody>
</table>

Number of grids listed = 1
GRDLIST - done
Access to large grids
Change in g2clib code vs. Using –ulimit
UACROSS with more than 100 levels

UACROSS KMIA KGRB SIG=YES PARAM=THA WINDB

New -XCD

Current -XCD
LFC/LCL, Precipitable water calculation adjustments for UA* commands

<table>
<thead>
<tr>
<th>Parcel Definition for 100 mb Boundary Layer: 1200 UTC 01 May 1989121</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dewpoint Temperature (TD) = 19.6 C</td>
</tr>
<tr>
<td>Potential Temperature (Th) = 296.9 K</td>
</tr>
<tr>
<td>Equivalent Potential Temperature (ThE) = 336.7 K</td>
</tr>
<tr>
<td>Mixing Ratio (MIX) = 15.0 g/kg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stability Indices and Levels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lifted Condensation Level (LCL) = 946 mb</td>
</tr>
<tr>
<td>Temperature at LCL (TLCL) = 19.1 C</td>
</tr>
<tr>
<td>Level of Free Convection (LFC) = 946 mb</td>
</tr>
<tr>
<td>Equilibrium Level (EL) = 277 mb</td>
</tr>
<tr>
<td>Convective Temperature (CVT) = 22.4 C</td>
</tr>
<tr>
<td>Forecast Maximum Temperature (FMAX) = 28.5 C</td>
</tr>
<tr>
<td>K Index (KI) = 5.2</td>
</tr>
<tr>
<td>Lifted Index (LI) = -1.3</td>
</tr>
<tr>
<td>Severe WEAtHer Threat Index (SwI) = 277.7</td>
</tr>
<tr>
<td>Showalter Index (ShI) = 12.6</td>
</tr>
<tr>
<td>Total Totals Index (TTI) = 25.9</td>
</tr>
<tr>
<td>Precipitable Water (PW) = 29.7 mm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy Analysis:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helicity (HELI) = 600 m<strong>2/s</strong>2</td>
</tr>
<tr>
<td>Convective Available Potential Energy (CAPE) = 591 J/kg</td>
</tr>
<tr>
<td>Convective Inhibition (CIN) = 34 J/kg</td>
</tr>
<tr>
<td>Theta-E for Forecast Maximum Temperature = 340 K</td>
</tr>
<tr>
<td>CAPE for Forecast Maximum Temperature = 1100 J/kg</td>
</tr>
<tr>
<td>Maximum Theta-E at or below 300 mb = 345 K</td>
</tr>
<tr>
<td>Pressure Level of Maximum Theta-E = 1016 mb</td>
</tr>
<tr>
<td>CAPE for Maximum Theta-E = 2042 J/kg</td>
</tr>
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UALIST: Done
PTLIST computed parameters with missing values

<table>
<thead>
<tr>
<th>ID</th>
<th>ST</th>
<th>TIME[HMS]</th>
<th>CIGC</th>
<th>CC1</th>
<th>CC2</th>
<th>TCOV</th>
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<tbody>
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<td>100000</td>
<td>2</td>
<td></td>
<td></td>
<td>8</td>
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<tr>
<td>KMSN</td>
<td>WI</td>
<td>110000</td>
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<td>1</td>
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</tr>
</tbody>
</table>

Number of matches found = 9
PTLIST: Done
STNDB.CORE updated GFS/NAM MOS stations

- DC - KDCA
- MD - K2W6, KCBE, KCGS, KDMW, KFME, KNUI
- NJ - K12N
- NY - KPBG, KRME
- PA - KLOM, KUKT
- VA - K6V3, KEMV, KFYJ, KJGG, KRMN
- VT - K1V4
- WV - K481, K116, KW22, KW99
- FL - K40J, KBCST, KSUA
- GA - K3J7, K47A, KBGE, KBIJ, KDBN, KDOH, KHQU, KJYL, KLZU, KMGR
- NC - K1A5, KCPA, KEHO, KEYF, KFFA, KGWW, KHNZ, KJQF, KLHZ, KONX
- PR - TJaq, TJJZ, TJSJ
- VI - TKPK, TNCM
- IA - K1IB, KMPZ, KPEA, KVTI
- SC - KHxD
- IL - K3LF, KAJG, KCIR, KCUL, KM30, KRSV, KSFY
- IN - KASW, KOKK
- KS - KP28, KPtt
- KY - K1A6, KGLW, KOWB
- MI - KCFs, KFKS, KLWA, KP53, KP58, KP59, KPZQ, KRNP, KVLL
- MN - KACP, KCDD, KCFE, KFKA, KGDB, KHZX, KLYV, KSYN, KTIC
- MO - KLXT
- ND - KBWP, KN60
- NE - KAFK, KBVN, KJHJ, KIBM, KLCG, KMLE, KTIF
- SD - K2WX, K8D3, K9V9, KD07, KICR
- AL - K3A1, K4A9, K79J, KALX, KHUA
- AR - KASG, KAWM, KMEZ
- LA - KACP, KAQV, KDNK, KDRI, KIER, KP92
- MS - KUTA
- OK - K1F0, KAQR, KAVK, KAXS, KCLK, KCUH, KQO
- TX - K6R6, KAOq, KATT, KBBD, KBKS, KBPG, KBWD, KBYY, KCPT, KDKR, KDUX, KE3B, KEBG, KECU, KERV, KP05, KFWS, KGDJ, KGCN, KGOP, KGPM, KGYT, KGYB, KHBB, KHFX, KHZQ, KINJ, KJAS, KJDD, KJSO, KJWY, KJXI, KLBR, KLHB, KLNC, KLUD, KMDD, KMKN, KORG, KOSA, KPEQ, KPKV, KPFA, KPSN, KPFW, KPYX, KRAS, KRBO, KRPH, KRWW, KSEP, KSLR, KSNK, KSOA, KSWW, KT65, KT82, KUVA, KXBP
- AZ - KEGU, KSW
- CO - K04V, K20V, K4BM, K7BM, KFCS, KMYP
- ID - KP69, KSZT
- MT - KGPI
- NV - KBJN, KHNZ, KINS, KP68
- UT - K4BL, K4HV
- WY - KP60, KPWA
- OR - KBOK, KRDN
- WA - KBVS, KORS
- CA - K9L2, KAUN, KNKX, KCVA
- AK - PAOH, Pahl, PP1Z
New XRD development

- WXSYMB
- SATCOMP
- GVARINFO update
SATCOMP

Customize overlap region
– reduces parallax errors

GOES-West/East
5km Parallax Overlap

Accurate Cloud Coverage
…..and beyond

• VIIRS ADDE Server
  • Prototype: very limited functionality
• polar2grid – fill in bowtie deletion
  • MS2GT (3rd party package) will be used to remove bow tie deletion and store in a reprojected Area file.
• Future data – INSAT 3D, Himawari 8 & 9 AHI, GOES-R ABI
  • Next generation ADDE servers
VIIRS ADDE Server

Left half of VIIRS granule with bowtie deletion
polar2grid
Bowtie removal for MODIS and VIIRS Images
Next Generation ADDE

- Still in the planning stage
  - Make use of McIDAS-V file adapters
  - Interface to the netCDF 4 Java library
  - Use Java or Python/Jython?
- All data formats that McIDAS-V can read locally, will also work remotely
- On hold, pending funding