Setup

```
Needs["MadrigalWeb`"]
```

```
mlhServer = "http://madrigal.haystack.mit.edu/cgi-bin/madrigal";
pfisrServer = "http://isr.sri.com/madrigal/cgi-bin/";
eiscatServer = "http://www.eiscat.com/madrigal/cgi-bin/";
```

Instruments

```
instruments = getInstruments[mlhServer];
```

Here is a list of the first 25 instruments in the database.

```
Style[{"Name", "Code"} /. instruments[[1 ;; 25]] // TableForm, Small]
```

```
Jicamarca IS Radar                      10
Jicamarca Bistatic Radar                11
Arecibo IS Radar - Linefeed             20
Arecibo IS Radar - Gregorian            21
Arecibo IS Radar - Velocity Vector      22
MU IS Radar                             25
Millstone Hill IS Radar                 30
Millstone Hill UHF Steerable Antenna    31
Millstone Hill UHF Zenith Antenna       32
St. Santin IS Radar                     40
St. Santin Nançay Receiver              41
St. Santin Mende Receiver               42
St. Santin Monpazier Receiver           43
Kharkov Ukraine IS Radar                45
Chatanika IS Radar                      50
ISTP Irkutsk Radar                      53
Poker Flat IS Radar                     61
EISCAT combined IS Radars               70
EISCAT Kiruna UHF IS Receiver           71
EISCAT Tromso UHF IS radar              72
EISCAT Sodankyla UHF IS Receiver        73
EISCAT Tromso VHF IS radar              74
Sondrestrom IS Radar                    80
Resolute Bay North IS Radar             91
EISCAT Svalbard IS Radar Longyearbyen   95
```

Experiments

Get all the experiments run on RISR-N between 2005 and today:

```
res = getExperiments[mlhServer, {2005, 1, 1},
   DateList[], "Local" → False, "InstrumentCode" → 91];
```

```
Manipulate[res[[n]] // TableForm, {n, 1, Length@res, 1}]
```

The Joule-2 rocket mission experiments (Joule-2 launched on 19 January 2007). Try January 2007:

```
joule2 = getExperiments[mlhServer, {2007, 1, 1}, {2007, 2, 1}, "InstrumentCode" → 61]
```

```
{}
```

It's not in the database during January 2007. There is a "Joule2" experiment, but it ran on March 1st:

```
year2007 = getExperiments[mlhServer, {2007}, {2008}, "InstrumentCode" → 61];
```

```
Pane[Sort@Transpose[{DateString[#, {"Year", "Month", "Day"}] & /@ ("StartDate" /. year2007),
     "Id" /. year2007, "Name" /. year2007, "Url" /. year2007}] //
  TableForm, Scrollbars → True, ImageSize → {450, 200}]
```

IPY01 – Long duration measurements in support of the International Polar Year	http:/
Joule2 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
IPY01 – Long duration measurements in support of the International Polar Year	http:/
WorldDay02 – Auroral and convection measurements	http:/
IPY01 – Long duration measurements in support of the International Polar Year	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/
WorldDay02 – Auroral and convection measurements	http:/

Experiment Files

```
<< "MadrigalWeb`"
```

```
results = getExperimentFiles[pfisrServer, 30001374];
```

```
results[[1]] // TableForm
```

```
Name → /opt/madrigal/experiments/2007/pfa/01mar07m/pfa070301.001
Kindat → 5962
KindatDescription → Alternating Code Uncorrected Ne
Category → 1
Status → Final
Permission → 0
ExperimentId → 30001374
```

```
getExperimentFiles[eiscatServer, 20001996][[1]] // TableForm
```

```
Name → /opt/madrigal/experiments/2011/lyr/04jan11/NCAR_2011-01-04_taro_60_42mc.bin
Kindat → 6800
KindatDescription → GUISDAP Fitted Parameters
Category → 1
Status → Final
Permission → 0
ExperimentId → 20001996
```

Parameters

```
<< "MadrigalWeb`"
```

```
params = getParameters[eiscatServer,
    "/opt/madrigal/experiments/2011/lyr/04jan11/NCAR_2011-01-04_taro_60_42mc.bin"];
```

```
params[[1]]
```

```
{Mnemonic → AZM, Description → Mean azimuth angle (0=geog N,90=east),
 IsError → False, Unit → deg, IsMeasured → True,
 Category → Geographic Coordinate, IsSure → True, IsAddIncrement → False}
```

Data

getData[...] is equivalent to isprintService.py. Replace the name, affiliation and email parameters below with your details. You can request “Date” instead of the usual “year”, “month”, “day”, etc., time parameters to get a DateList[] for each entry.

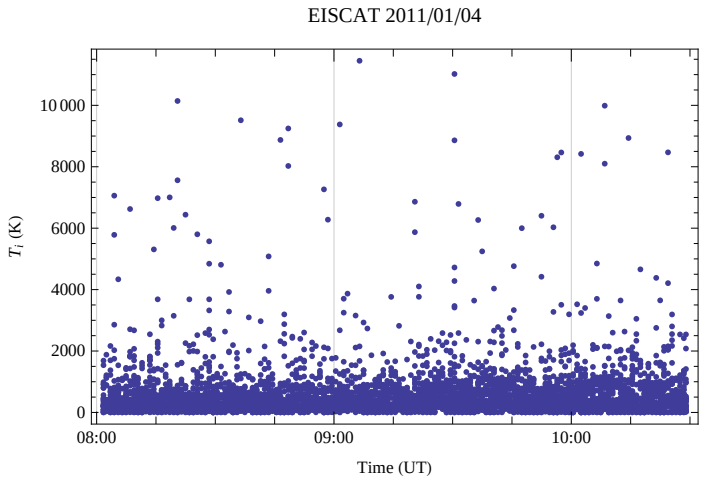
```
file = "/opt/madrigal/experiments/2011/lyr/04jan11/NCAR_2011-01-04_taro_60_42mc.bin";
```

```
data = getData[eiscatServer, file, {"Date", "Gdlat", "Glon", "Gdalt", "Ti"},
    "Your name", "Your affiliation", "Your email address"];
```

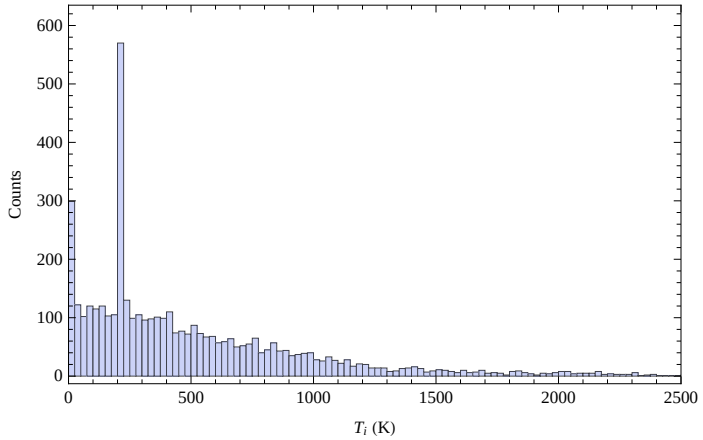
```
Length@data
```

```
54 534
```

```
DateListPlot[data[[All, {1, 5}]], PlotRange → All,
 FrameLabel → {"Time (UT)", "Tᵢ (K)"}, PlotLabel → "EISCAT 2011/01/04"]
```




```
Histogram[data[[All, 5]], {25}, PlotRange → {{0, 2500}, Automatic},
 FrameLabel → {"Tᵢ (K)", "Counts"}, Frame → True, PlotRangeClipping → True]
```



Position Calculator

```
positionCalculator[mlhServer, {2000, 1, 1, 0, 0, 0},
  {20, 20, 1}, {40, 40, 1}, {100, 1000, 100}, {"bn", "be", "bd"}] // TableForm
```

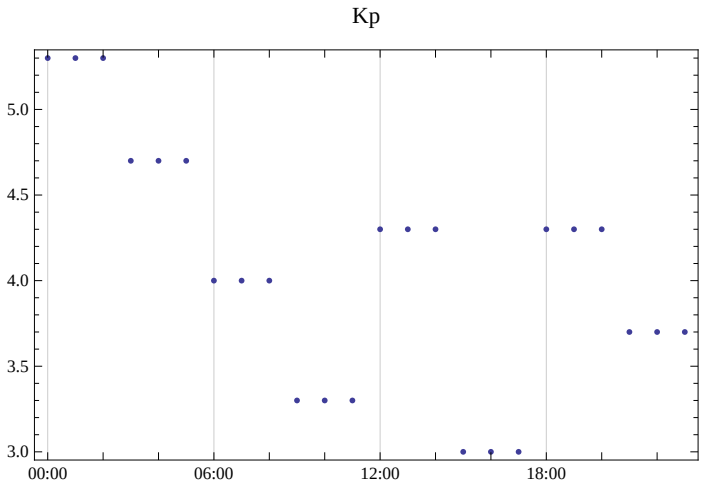
20.	40.	100.	0.0000333234	1.23496×10^{-6}	0.0000169369
20.	40.	200.	0.0000316262	1.07698×10^{-6}	0.0000160164
20.	40.	300.	0.0000300452	9.35348×10^{-7}	0.0000151675
20.	40.	400.	0.0000285704	8.08212×10^{-7}	0.0000143829
20.	40.	500.	0.0000271929	6.93945×10^{-7}	0.0000136562
20.	40.	600.	0.0000259046	5.91137×10^{-7}	0.0000129818
20.	40.	700.	0.0000246983	4.98556×10^{-7}	0.0000123547
20.	40.	800.	0.0000235674	4.15122×10^{-7}	0.0000117707
20.	40.	900.	0.0000225061	3.39887×10^{-7}	0.0000112258
20.	40.	1000.	0.0000215089	2.72013×10^{-7}	0.0000107166

Time Calculator

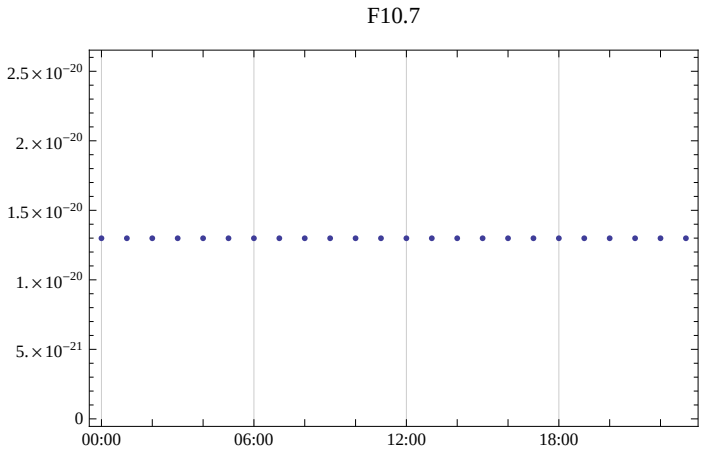
```
results = timeCalculator[mlhServer,
   {2000, 1, 1, 0, 0, 0}, {2000, 1, 1, 23, 59, 59}, 1, {"Kp", "F10.7"}];
results[[1 ;; 2]]
```

$$\{\{\{2000, 1, 1, 0, 0, 0.\}, 5.3, 1.299 \times 10^{-20}\}, \{\{2000, 1, 1, 1, 0, 0.\}, 5.3, 1.299 \times 10^{-20}\}\}$$

```
DateListPlot[results[[All, {1, 2}]], PlotLabel → "Kp"]
```



```
DateListPlot[results[[All, {1, 3}]], PlotLabel → "F10.7"]
```



Geodetic coords of radar beam

```
radarToGeodetic[mlhServer, {42.619, 288.51, 0.146},
  {{100, 45, 1000}, {100, 55, 1000}, {100, 65, 1000}}] // TableForm
```

41.3613	−64.0127	742.038
41.6458	−65.4882	841.795
41.9327	−67.0984	918.473

Radar beam coords from geodetic

```
geodeticToRadar[mlhServer, {42.619, 288.51, 0.146},
  {{42, 290, 1000}, {42, 290, 2000}, {42, 290, 3000}}] // TableForm
```

117.704	80.8251	1011.25
116.906	84.8024	2006.35
116.27	86.1395	3004.71

Trace magnetic field

```
traceMagneticField[mlhServer, {2004, 1, 1},
  {{0.583, -0.95987, 0.269}, {0.6, -10., 0.3}, {0.6, -1., 0.3}, {0.6, -10., 0.3},
   {0.6, -1., 0.3}}, "InCoordinates" → "GSM", "OutCoordinates" → "Geodetic",
  "TargetLocation" → "NorthAlt", "StopAlt" → 1000.000000] // TableForm
```

Missing[]	Missing[]	Missing[]
1000.	74.6916	102.005
1000.	19.0268	129.445
1000.	74.6916	102.005
1000.	19.0268	129.445