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EMULATE: land station daily MSLP series

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86 Land station daily MSLP series were included in the final gridded MSLP product, EMSLP3. Two MSLP series for each of the 86 stations are provided here. These correspond to the 'uncorrected' and 'corrected' series. The corrections will be described in detail below. Firstly, the format of the files is described.

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### 1. Format

Each file is in ascii format. There are two lines of header information. The first line is the station name (including the directory).

The second line contains some important station details:  
station\_number, first\_year, last\_year, latitude, longitude, station height

eg. For La Coruna

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8001 1865 2002 4316 -850 58
```

The series then follows with  
year, month, day, pressure

#### Notes:

- \* the pressure is at mean sea level and is given in hPa.
  - \* missing MSLP values are given as -999.90
  - \* if there is no station number, it is given 99999
  - \* station height is given in metres
  - \* if no details of station height were available, we used the height given in the WMO records
  - \* if a change of height was known, we took an average of the heights.
  - \* latitudes are in degrees (not degree and minutes) x 100. For example:  
45 degrees N, 30 minutes = 45.5 x 100 => 4550  
43 degrees N, 15 minutes = 43.25 x 100 => 4325
  - \* longitudes are in degrees (not degrees and minutes) x 100. West is denoted by negative values. For example,  
30 degrees E, 12 minutes = 30.2 x 100 => 3020  
10 degrees W, 55 minutes = -10.92 x 100 => -1092
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### 2. 'Uncorrected' Series

These files are denoted by the file ending : .ts.asc  
For example for Malta the filename is:

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emulate_malta.ts.asc
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Although they are classed here as 'uncorrected', many of these stations have undergone considerable quality control (eg. WASA, IMPROVE stations, Durham etc). We call them 'uncorrected', because we (at the Hadley Centre) have applied minimal corrections - they are basically in the form that we received the data in. Minimal corrections refer to correcting typos, calculating the daily average, filling in missing data points in a couple of stations (using a different source) and reducing Hohenpeissenberg, Jena, Milan and Athens to mean sea level.

As other groups have spend considerable time working on these series (a big thanks to David Lister, Manola Brunet-India, Anders Moberg etc), it is appropriate to give the main point of contact for each of these 'uncorrected' series. The name given below does not always correspond to the original source of the data, however they can probably point you in the right

direction!

aberdeen: WASA & R. Allan	london : Rob Allan
alexandria: R. Allan	lugansk: D. Lister
algiers: R. Allan	lund: WASA
ammassalik: WASA	lyon: R. Allan
angra: R. Allan	madrid: M. Brunet-India
archangel: D. Lister	malta: D. Lister
armagh: R. Allan	milan: IMPROVE
astrakhan: D. Lister	montreal: V. Slonosky
athens: R. Allan & D. Founda	moscow: D. Lister
baghdad: R. Allan	nikolaef: D. Lister
barcelona: M. Brunet-India	nordby: WASA & A. Moberg
beirut: R. Allan	oksoyfyf: WASA & A. Moberg
bergen: WASA & A. Moberg	orenburg: D. Lister
bermuda: D. Lister	padua: IMPROVE
biarritz: R. Allan	palerma: M. Barriendos
biskra: R. Allan	paris: M. Barriendos
bodo: WASA & O. Nordli & D. Lister	plymouth: R. Allan
brest: R. Allan	potsdam: WASA
cadiz: M. Brunet-India & IMPROVE	prague: D. Lister
corfu: D. Lister	providence: D. Lister
debilt: T. Brandsma	reykjavik: P. Jones
diarbekir: R. Allan	riga: D. Lister
durham: D. Lister	rochefort: R. Allan
fao: R. Allan	rome: R. Allan
funchal: R. Allan	scutari: D. Lister
galway: R. Allan (K. Hickey)	sevastopol: D. Lister
gibraltar: M. Rodwell & D. Wheeler	sibiu: D. Lister
godthaab: R. Allan	stjohns: V. Slonosky
goteborg: WASA & A. Moberg	stockholm: WASA & A. Moberg
halifax: D. Lister & V. Slonosky	stornoway: R. Allan
hammerodde: WASA	stpetersburg: D. Lister
haparanda: WASA & A. Moberg	stykkisholmur: WASA
harnosand: WASA	tenerife: M. Brunet-India
helsinki: WASA	tiflis: D. Lister
hohenpeissenberg: J. Jacobeit	torshavn: WASA & A. Moberg
jena: T. Ansell & F. Gerstengarbe	toulon: R. Allan
kazan: D. Lister	upsala: WASA & A. Moberg
kem: D. Lister	valentia: WASA & R. Allan
kiev: D. Lister	vardo: O. Nordli & D. Lister
kostruma: D. Lister	vestervig: WASA
lacoruna: M. Brunet-India	visby: WASA & A. Moberg
lesina: R. Allan	wilna: D. Lister
lisbon: R. Allan	zagreb: L. Srnc

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### 3. 'Corrected'

These files are denoted by the file ending : .ts.diurnal.adj.asc  
For example for Malta the filename is :  
emulate\_malta.ts.diurnal.adj.asc

Firstly we apply a correction for the diurnal and semi diurnal oscillation. We use the phase and amplitude fields (seasonal) calculated by Dai and Wang (1999) to estimate the diurnal & semi diurnal cycle at each station. Observation hours for each day of a station series have been produced and these are then used to determine the appropriate adjustment, given the cycle. Due to a lack of sufficient sub-daily data, we were unable to calculate the diurnal and semidiurnal cycle at each station directly. The Dai and Wang fields are on a 5x5 degree latitude longitude grid and hence we interpolate the nearest grid point to our station. It is rather a crude adjustment, however corrections are generally small and, as stated above, it was not possible to estimate diurnal waves directly for each station in this project.

Secondly, we adjust the series such that the monthly mean is equal to a reference monthly mean (either the corresponding ADVICE station series, that interpolated from the nearest ADVICE grid point, or from the nearest HadSLP grid point). Specifically, the monthly means are calculated from the daily series and compared to the reference ADVICE/HadSLP monthly value. The difference in monthly means is then used to adjust the daily SLP values. There was some concern about jumps in adjustments at the end of each month, so a slight smoothing was applied to the monthly adjustments. Preference was given to the ADVICE station series where possible, however in some cases problems were found with the ADVICE station series. In these instances, the ADVICE gridded value was used.

For the Canadian stations and those in the far east of the EMULATE region a final adjustment was required so that their daily average represented the same 24 hour period as the other series. The Canadian stations are 5 hours behind, the Russian 4 hours ahead. As only daily averages were available, we were forced to interpolate between the preceding (following) day and the actual day for the Canadian (far Russian) stations.

These are denoted as : ts.diurnal.adj.gmt.ts

Finally after all quality control checks were performed, a number of remaining gross outliers were identified. These were either corrected or replaced with missing values. This effected 4 stations and these are denoted:  
ts.diurnal.adj\_g\_error\_corr.ts.asc

eg.  
emulate\_gibraltar.ts.diurnal.adj\_g\_error\_corr.ts.asc

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#### 4. Remaining issues

We do still have some concerns about the quality of a number of series. To properly quality control 86 stations would require more than time allocated to the whole of the EMULATE project. Because the data would undergo further quality control in the gridding procedure, we decided to proceed with the stations series as they stood. For research being conducted with individual station series, we would recommend however that some caution to be exercised.

Any feedback would be extremely useful!

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#### 5. References

Dai, A. and Wang, J. (1999) 'Diurnal and Semidiurnal Tides in Global Surface Pressure Fields', J. Atmos. Sci., 56, 3874-3891