

Magnetic Declination

Introduction

1. Magnetic declination is the difference between magnetic north and true north. In Matienzo, magnetic north (where compasses read 0 degrees) was about 7 degrees west of true north in 1975 and has been reducing continuously to about 0 in 2021.
2. Survey compass readings have been adjusted (manually or in Survex) to align them with true north. A compass reading of 1.5 degrees in 2013 would be adjusted to 0 by the Survex command `*CALIBRATE DECLINATION 1.5`. A compass bearing of 90 would be adjusted to 88.5 degrees. Following this procedure allows surveys to be directly compared, extended and linked with a common grid system.
3. Maps used in Matienzo had coordinates and a grid based on the UTM European 1979 system. Our GPS units were set up for this system. Unfortunately, north in this grid system currently lies between magnetic north and true north. This was pointed out by Footleg a while ago as he was trying to prepare data for the Matienzo Google Maps facility. Paul has calculated that the necessary adjustment is -0.4 degrees. So, in Survex, in 2013, the command `*CALIBRATE DECLINATION 1.5` will adjust compass readings to the true north grid
`*CALIBRATE DECLINATION 1.1` will adjust compass readings to the Eur79 grid.
4. The datum and grid system now used is ETRS89. This aligns (for our purposes) almost exactly over the Eur79 grid.

Consequences

1. All previous cave surveys which have been drawn up and have a "North grid" compass rose are aligned to true north and not grid north. Not a big issue. There will be no need to redraw old surveys.
2. Centre lines currently plotted on a ETRS89 map (eg the AutoCad map) are out by 0.4 degrees. This rotation about the entrance will move a point one kilometre from the entrance about 7m. Again, this is not a big issue (less than most survey error) but, with accuracy possibly increasing and the use of molephones, etc to link caves above and below ground, having information on maps as accurate as possible is better. The centre lines also appear on Google Earth with the same error.

Solution

1. There was no satisfactory quick solution, as nearly all .svx files (1923 of them) needed inspecting and most altering. This exercise was carried out over December 2013.

Procedure

1. To hand, a list of the Easter and summer magnetic declinations going back to 1974 from the NOAA website.
2. Definitions:
`OldMagDec` = magnetic declination used in the Survex file
`NOAMagDec` = Declination for that period from the NOAA web site
`NewValue` = `NOAMagDec - OldMagDec - 0.4`
3. In some files, `OldMagDec` was the same or very close to `NOAMagDec` and so
`NewValue` = `OldMagDec - 0.4`
4. The Survex files fell into four categories
 1. Survex files derived from the Acorn Archimedes, where the compass reading has already been adjusted for mag dec and there is no `*CALIBRATE DECLINATION` command. The mag dec used is hidden away in other dated archived files. A new line `*CALIBRATE DECLINATION NewValue` was entered with a comment to document the change.
 2. Survex files that contain just one batch of data and one `*CALIBRATE DECLINATION OldMagDec` line. This was commented out and a replacement `*CALIBRATE DECLINATION NewValue` entered with a comment to document the change.
 3. Longer Survex files which contain a number of batches of data enclosed between `*BEGIN` and `*END`. Each batch should contain a `*CALIBRATE DECLINATION` line. This was commented out and a replacement `*CALIBRATE DECLINATION NewValue` entered with a comment to document the change.
 4. Survex files which bring together other Survex files by running `*INCLUDE` commands. As these are not data files, they do not contain `*CALIBRATE DECLINATION` lines and should not need altering.
 5. Combination of 1 & 3, eg Risco survey data.

Note

1. Future map changes may well require another alteration to align with a new map grid but that change to the files is likely to be less long winded as the date "11/12/13" is present in all files and can act as a marker for a future change script.

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