Answers to Exercise 5 – Probabilistic flood hazard mapping including spatial dependence and uncertainty estimation

This document gives the MatLab code and Excel statements needed to produce the maps/figures described in the exercise. In many cases there may be alternative ways to perform these tasks, these are merely given as a suggestion. They may also give a little guidance on how the task might be performed using other software.

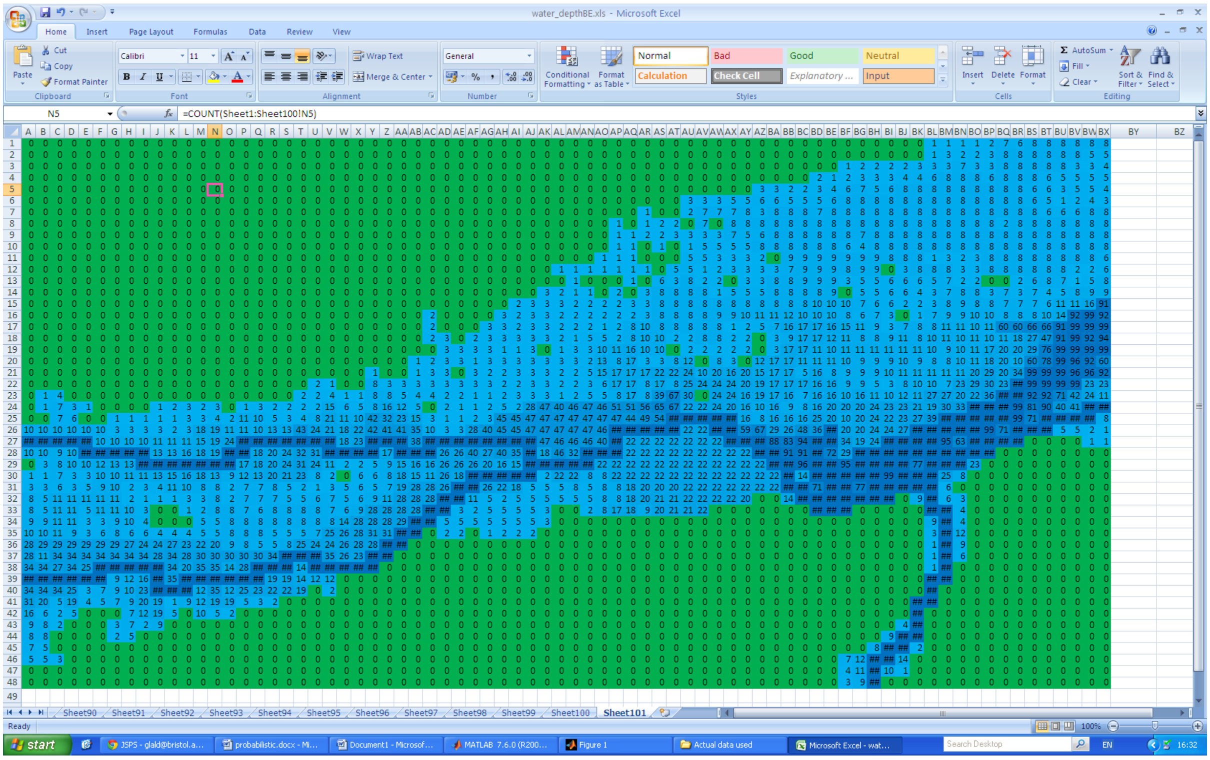
Task 1: Probabilistic hazard map for the Flood River Valley

Excel:

Type the following statement into cell A1 in sheet 101 and drag to copy across all applicable rows and columns:

=COUNT(Sheet1:Sheet100!A1)

Colour the data using conditional formatting. In Excel 2007 this is available under the "Home" tab:

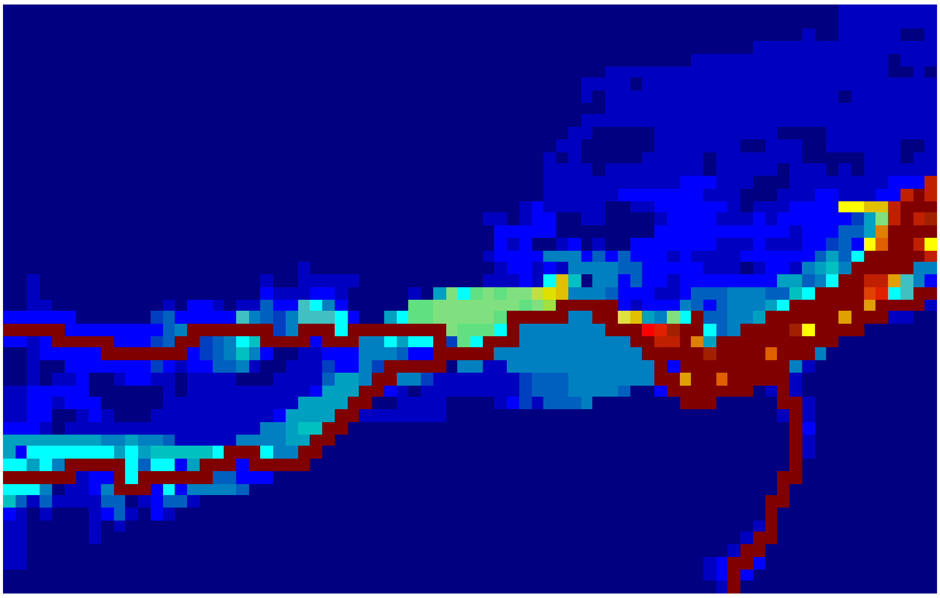


Matlab:

```
probBE=zeros(48,76);

for xx=1:100
    temp=water_depthBE.(['max',num2str(xx)])~=0;
    probBE=probBE+temp;
end

imagesc(probeBE)
axis off
```



<u>Task 2 – Investigating the effect of spatial dependance</u>

a) Investigating the "worst case scenario"

After sorting the flux values in descending order, the values highlighted in the modified .bdy file below should have been identified.

```
Mock hydrographs for probabilistic haz map exercise bdy file 1
channel
3       seconds
0       0
1.40000000000      50000
0         100000
trib1
3       seconds
0       0
1.030432866      50000
0         100000
trib2
3       seconds
0       0
0.561712963      50000
0         100000
```

Importing data into Matlab:

```
[water_depthW, ncols, nrows, xllcorner, yllcorner, cellsize] =
ascii_reader ('C:\MyFolder\MyFile.asc')
```

Identifying the worst case 1/100 outline

Excel: after opening the res.max file in excel, open a new worksheet and type :
`=COUNTIF(res!A1,">0")` into cell A1 in sheet 101 and drag to copy across all applicable rows and columns

Matlab: `AE01W=water_depthW>0;`

b) Identify best estimate 1/100 outline

Excel: Open a new worksheet and type the following statement into cell A1 in sheet 101 and drag to copy across all applicable rows and columns:

```
=COUNTIF(Sheet101!A1,">9")
```

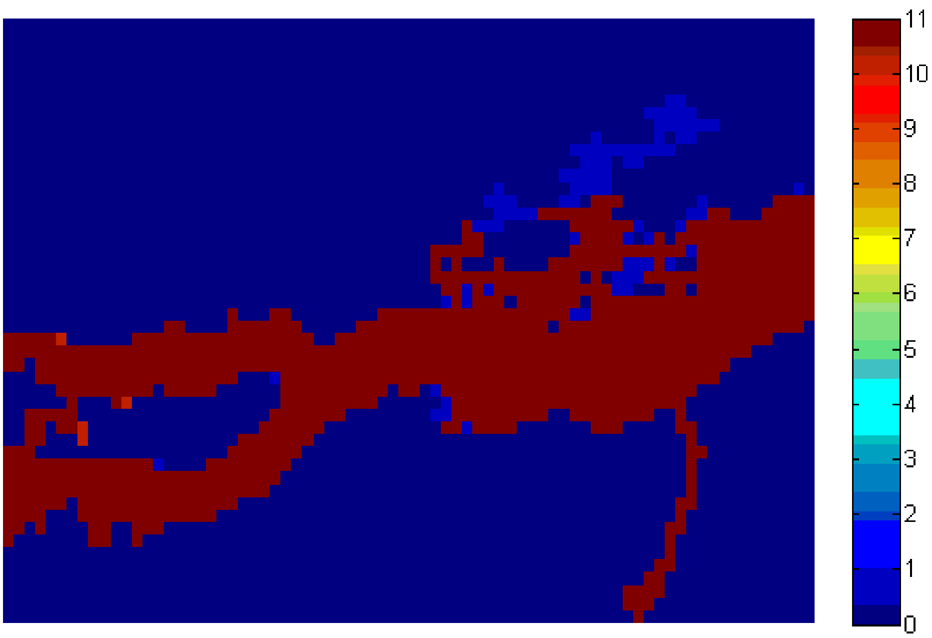
Matlab: `AE01BE=probBE>9;`

c) Comparing flood extents

Excel: Open another new worksheet in the res.max file you have opened in Excel. Type the following into cell A1: `=Sheet2!A1+([water_depthBE.xls]Sheet102!A1*10)` and copy across all applicable rows and columns. (again, you could use conditional formatting to visualise results, resulting figure shown only for MatLab below)

Matlab: `comparison=(AE01W+(AE01BE*10))`

```
imagesc(comparison)
axis off
colorbar
```

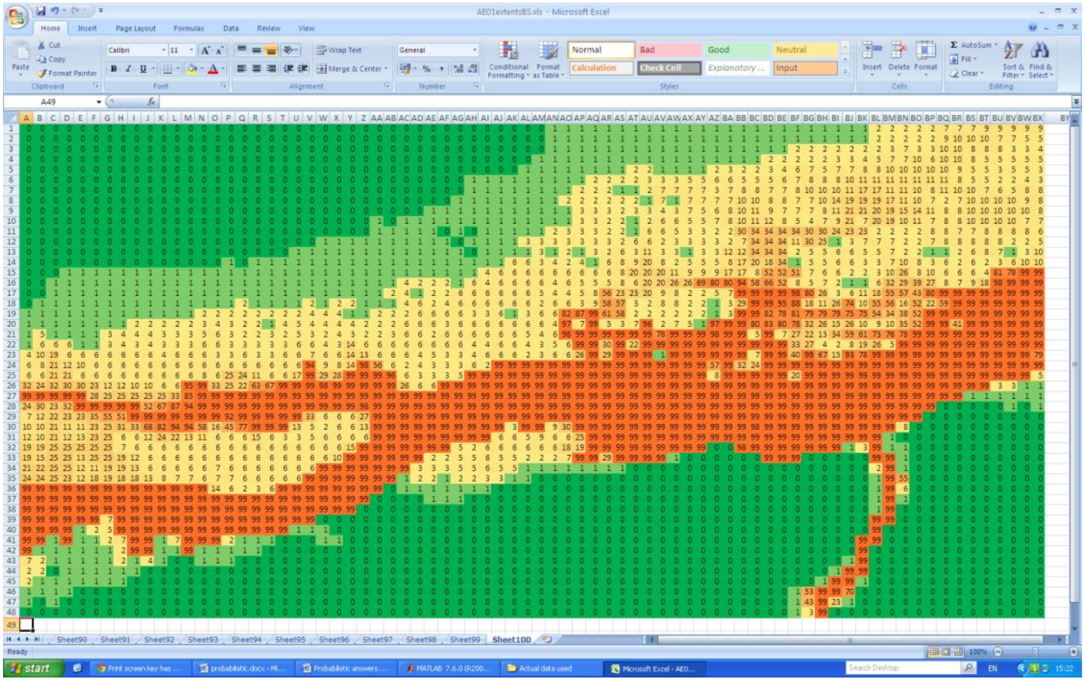


Note: This figure is based on simulation of the worst case scenario using Lisflood version 5.8.6. Although results are not expected to change using future versions, very minor changes cannot be ruled out.

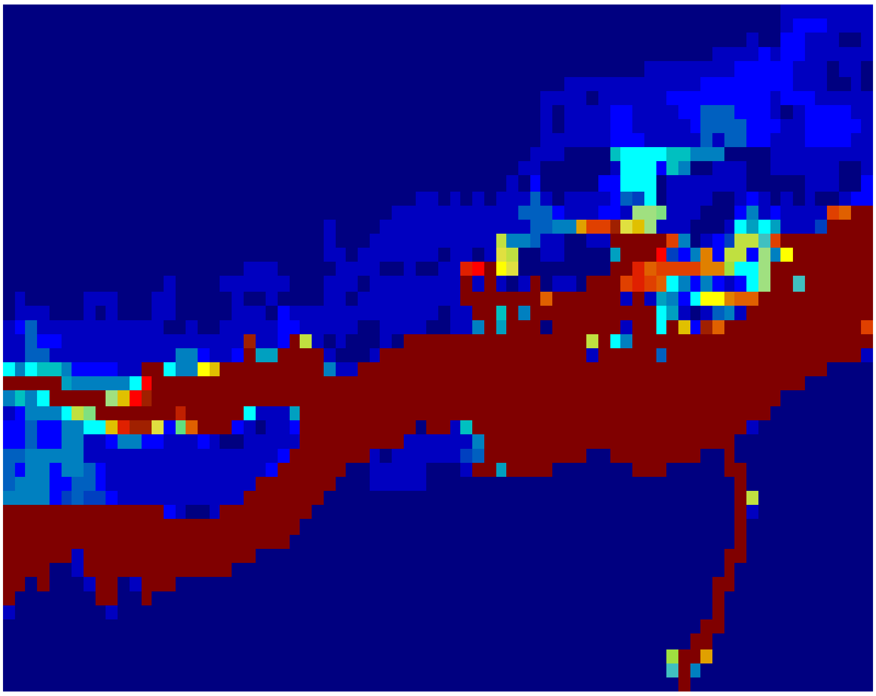
Task 3 – Estimating uncertainty due to short records

a) Map of uncertainty

=COUNT(Sheet1:Sheet99!A1) or =SUM(Sheet1:Sheet99!A1)

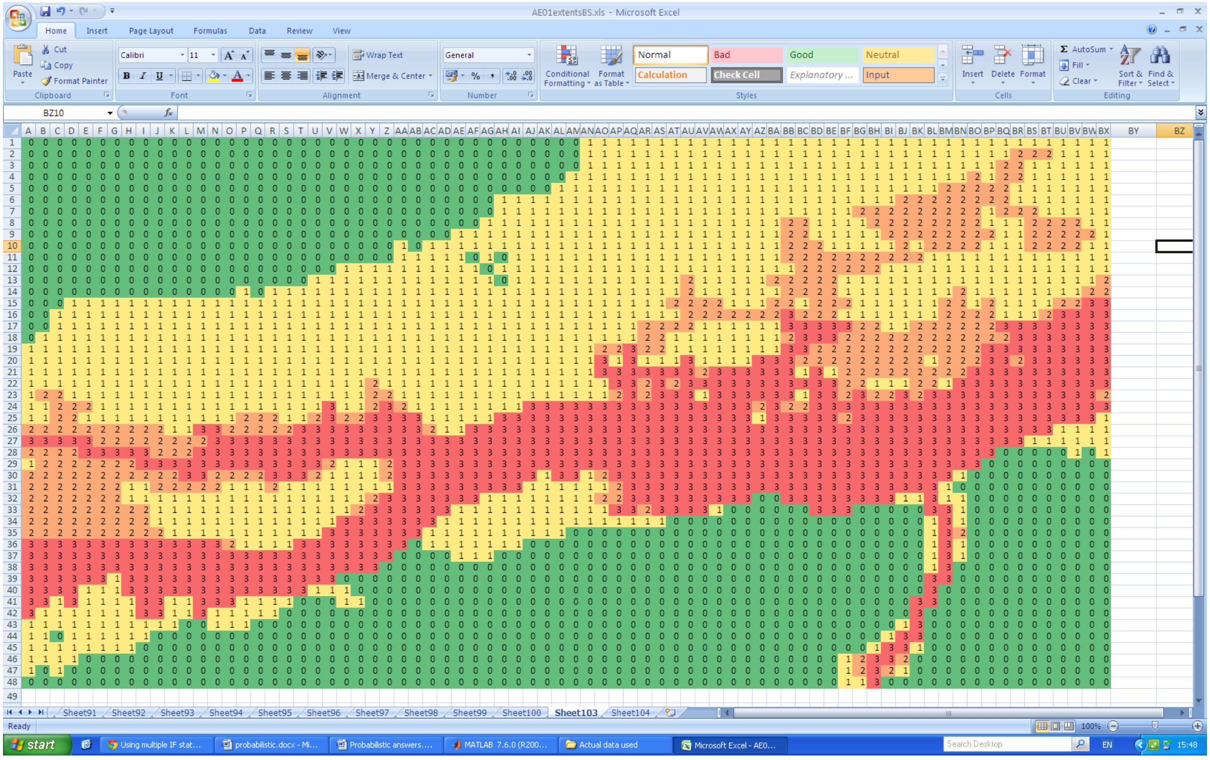


```
uncertainty=zeros(48,76);
for yy=2:100
    uncertainty=uncertainty+AE01BS.(['BS',num2str(yy)]);
end
```

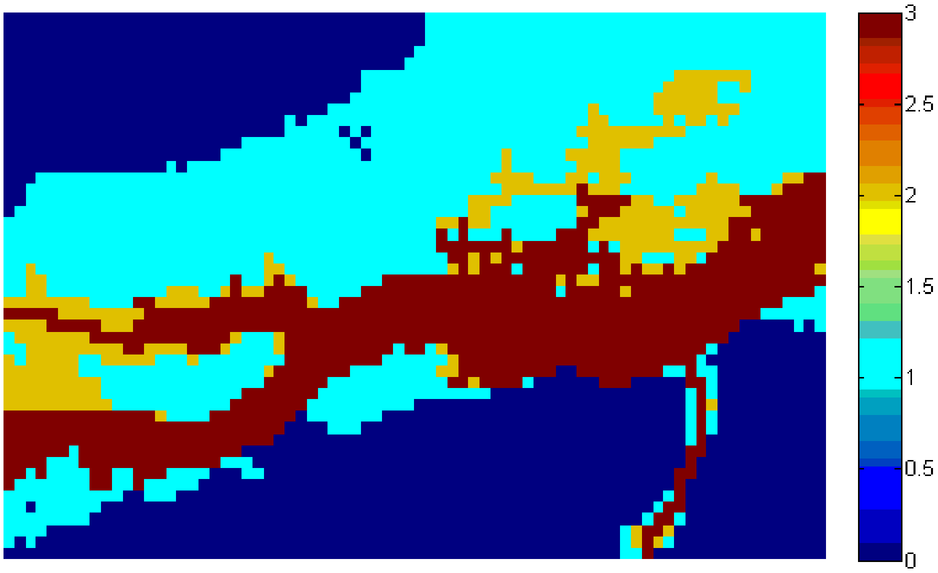


b) Delineating the maximum predicted flood extent and highlighting the 80% confidence interval

```
=IF(Sheet100!A1=0,0,IF(Sheet100!A1<10,1,IF(Sheet100!A1<91,2,3)))
```



```
temp=uncertainty;
for xx=1:48
    for yy=1:76
        if temp(xx,yy)>0 && temp(xx,yy)<11 % largest extents
            temp(xx,yy)=1;
        elseif temp(xx,yy)>10 && temp(xx,yy)<91 % 80% of simulations
            temp(xx,yy)=2;
        elseif temp(xx,yy)>90 %floods during smallest 10%
            temp(xx,yy)=3;
        else
        end
    end
end
```



Optional task for Matlab:

```
imagesc(probBE)
hold on
contour(1:76,1:48,uncertainty,[10 10],'k:','LineWidth',2);
contour(1:76,1:48,uncertainty,[90 90],'k:','LineWidth',2);
contour(1:76,1:48,probBE,[10 10],'k','LineWidth',3);
axis off
```