Intégration des méthodes de rendu dans un SIG et conception de cartes stylisées

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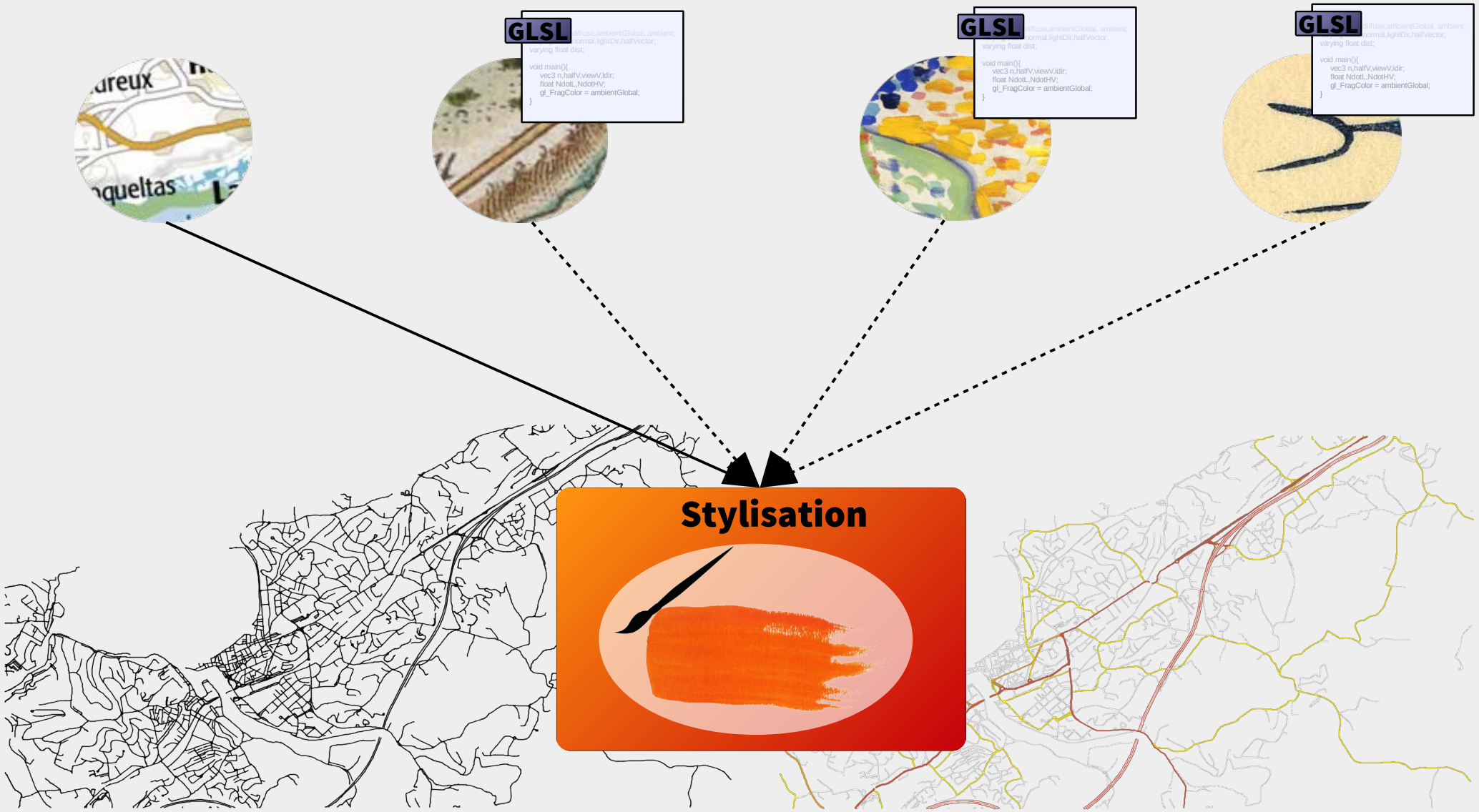
COGIT

MATIS

29-09-2016

Agence Nationale de la Recherche ANR Mapstyle

Augmenter l'expressivité des cartes produites par **SIG**



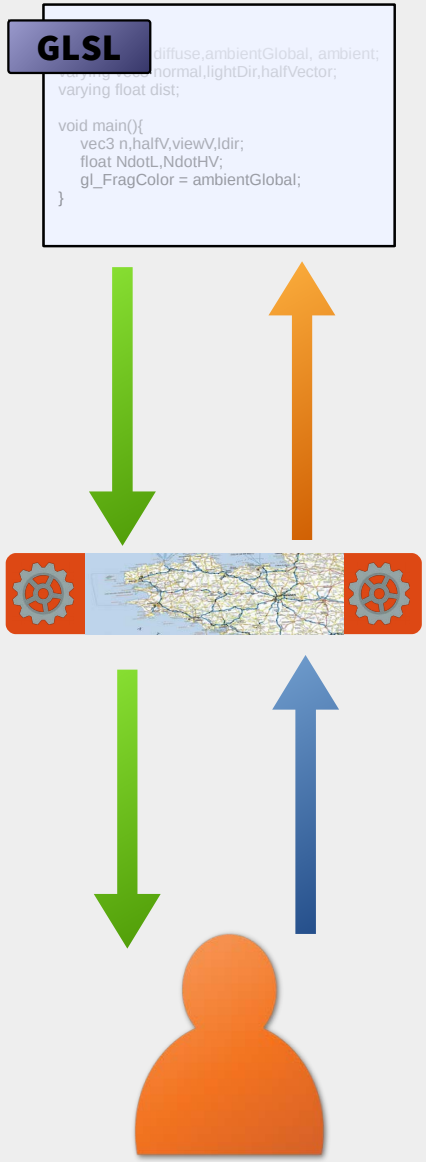
Données préparées

Rendu

Moteur de rendu cartographique

Shaders → méthode expressive

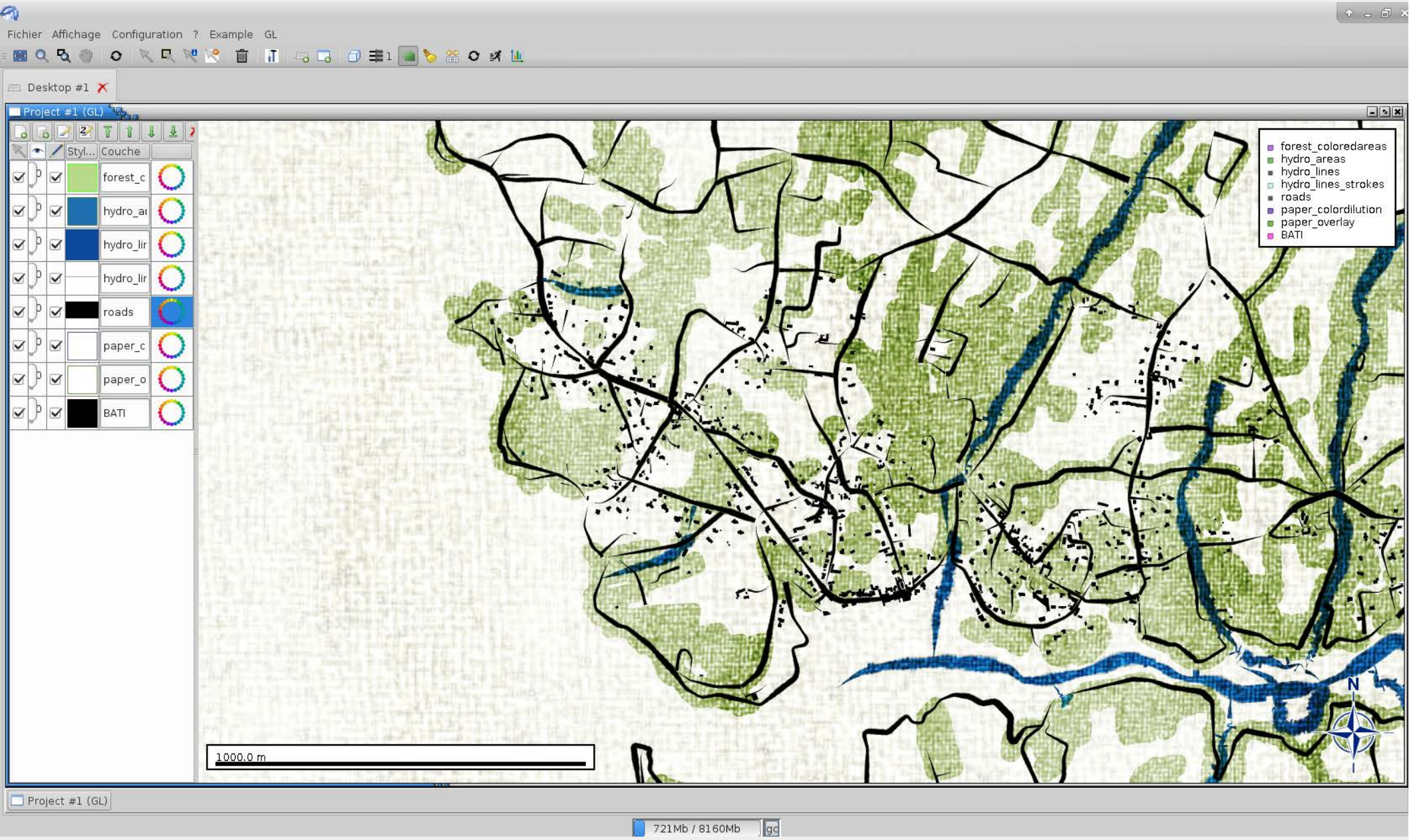
Formalisme de stylisation



Moteur de rendu cartographique

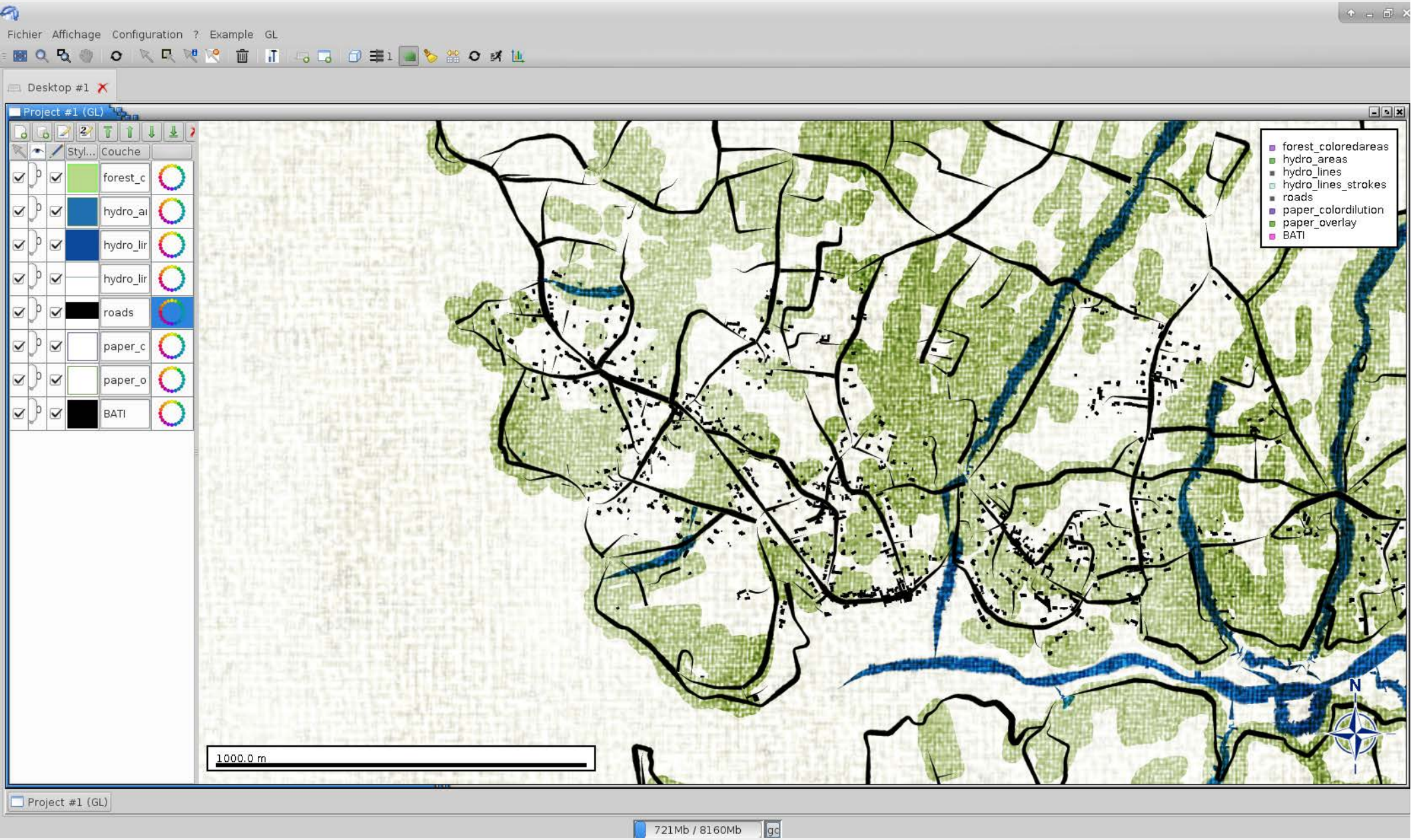
Version OpenGL de Geoxygene (Jeremy Turbet, David Vanderhaeghe)

JAVA (LWJGL)



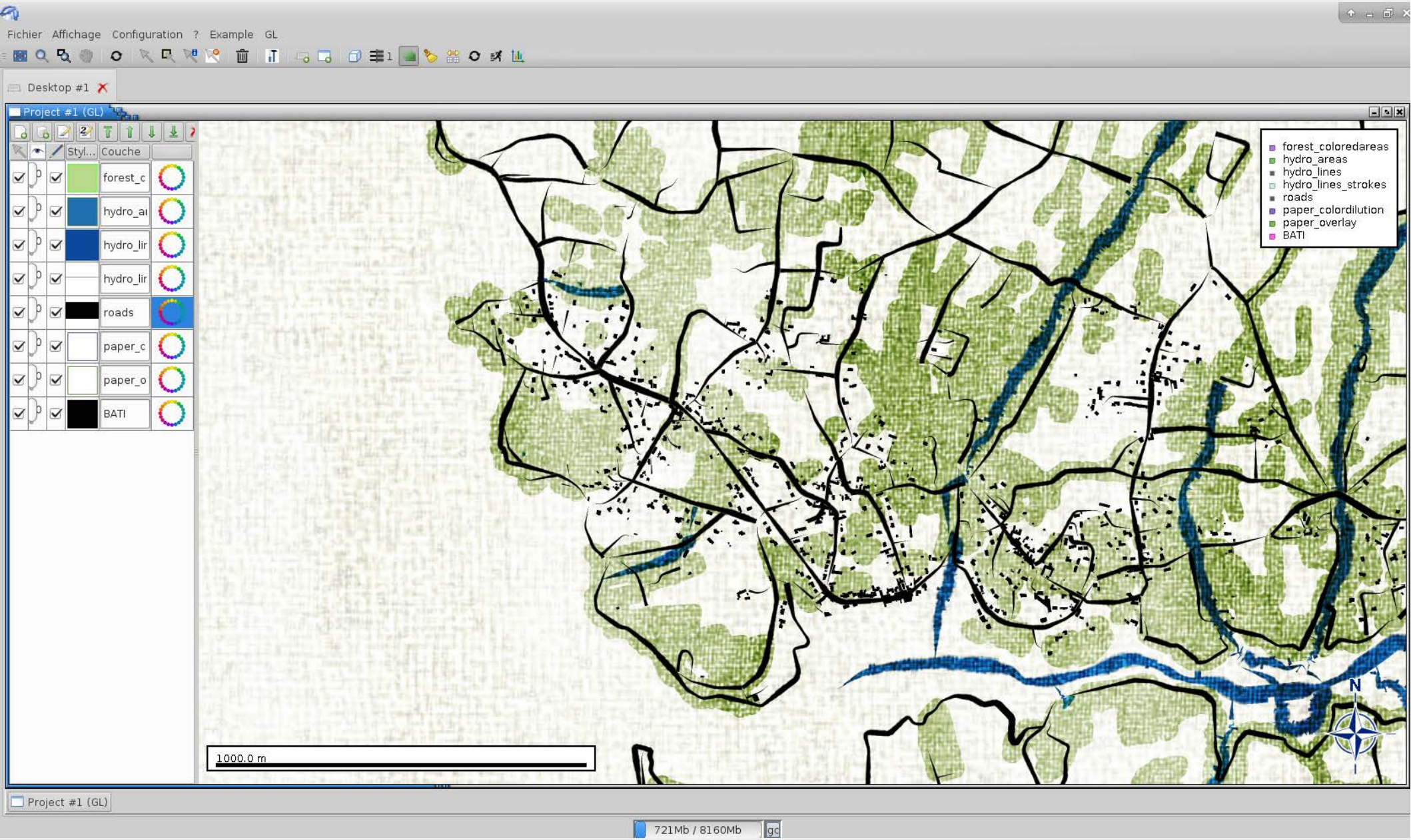
Version OpenGL de Geoxygene (Jeremy Turbet, David Vanderhaeghe)

JAVA (LWJGL) **OpenSource (LGPLv2)**



Version OpenGL de Geoxygene (Jeremy Turbet, David Vanderhaeghe)

JAVA (LWJGL) **OpenSource (LGPLv2)** **Standards OGC**



Shaders → méthode expressive

Intégration des shaders comme nouveaux outils de dessin
(méthode expressive)

Intégration des shaders comme nouveaux outils de dessin
(méthode expressive)

Ajout d'une méthode ?

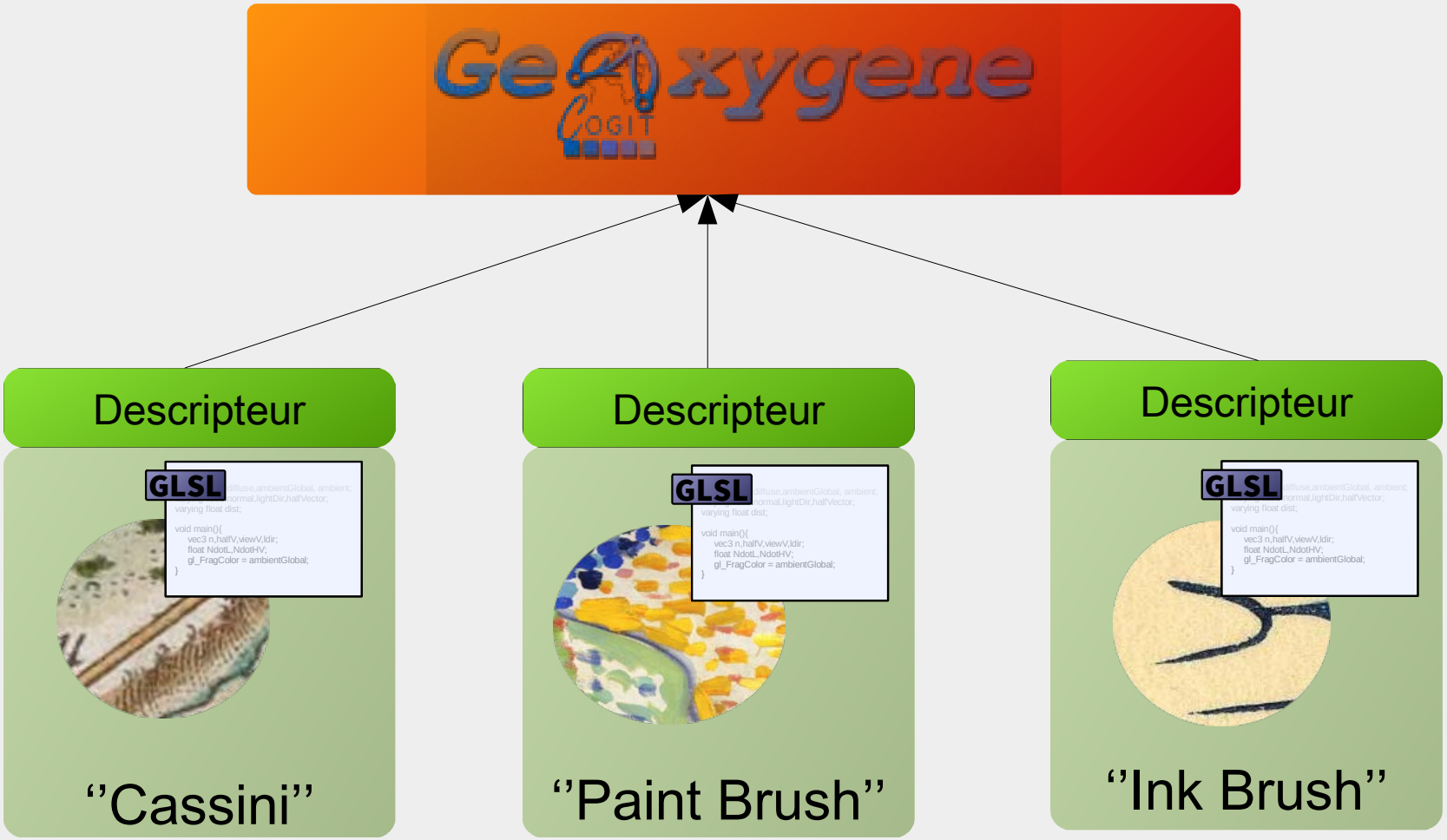
Intégration des shaders comme nouveaux outils de dessin
(méthode expressive)

''Cassini''

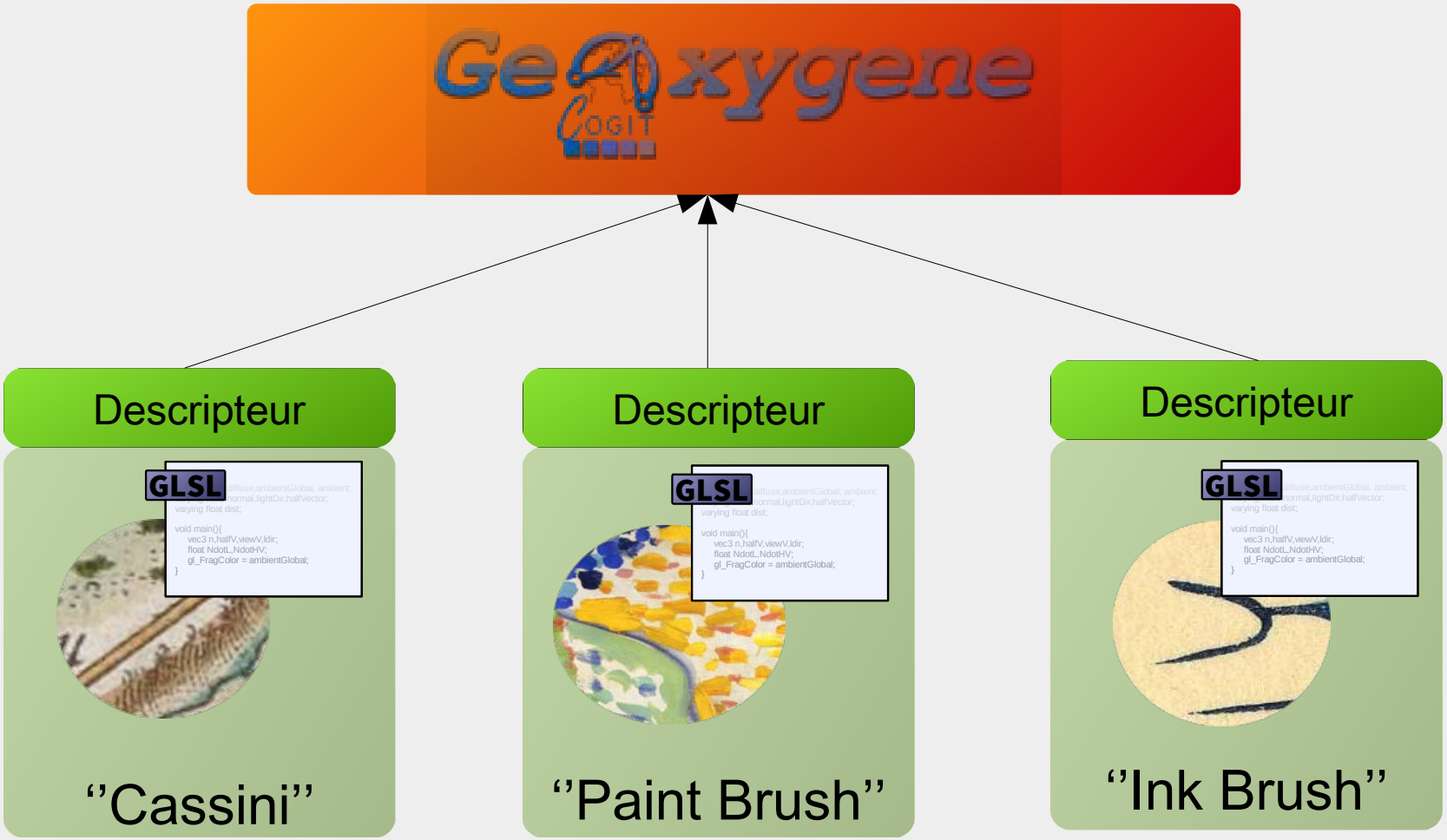
''Paint Brush''

''Ink Brush''

Intégration des shaders comme nouveaux outils de dessin **(méthode expressive)**



Intégration des shaders comme nouveaux outils de dessin **(méthode expressive)**



Intégration des shaders comme nouveaux outils de dessin **(méthode expressive)**

Nom de la méthode

Héritage

Lien vers les shaders

Métadonnées de paramétrage

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<RenderingMethod>
    <Name>DerainStrokePainting</Name>
    <GeneralMethodReference>BrushStroke</GeneralMethodReference>
    <ShaderList>
        <ShaderRef gltype="GL_FRAGMENT_SHADER">../shaders/subshader1d.derain.frag.glsl</ShaderRef>
    </ShaderList>
    <Parameters>
        <Parameter required="true">
            <Description>The portion of the stroke extremities where the brush
                sharpness smoothly increases/decreases.</Description>
            <Name>extremitiesLength</Name>
            <Type>float</Type>
            <Default>1.0</Default>
            <Restrictions>
                <BoundsRestriction min="0.0" max="1000.0" />
            </Restrictions>
            <UniformReference>extremitiesLength</UniformReference>
        </Parameter>
    </Parameters>
</RenderingMethod>
```

Formalisme de stylisation

Formalisme

Spécifications OGC **S**tyled **L**ayer **D**escriptor et **S**ymbology **E**ncoding

Générique **Interopérable** **Standard** **Lisible**

Formalisme

Spécifications OGC **S**tyled **L**ayer **D**escriptor et **S**ymbology **E**ncoding

Générique **Interopérable** **Standard** **Lisible**

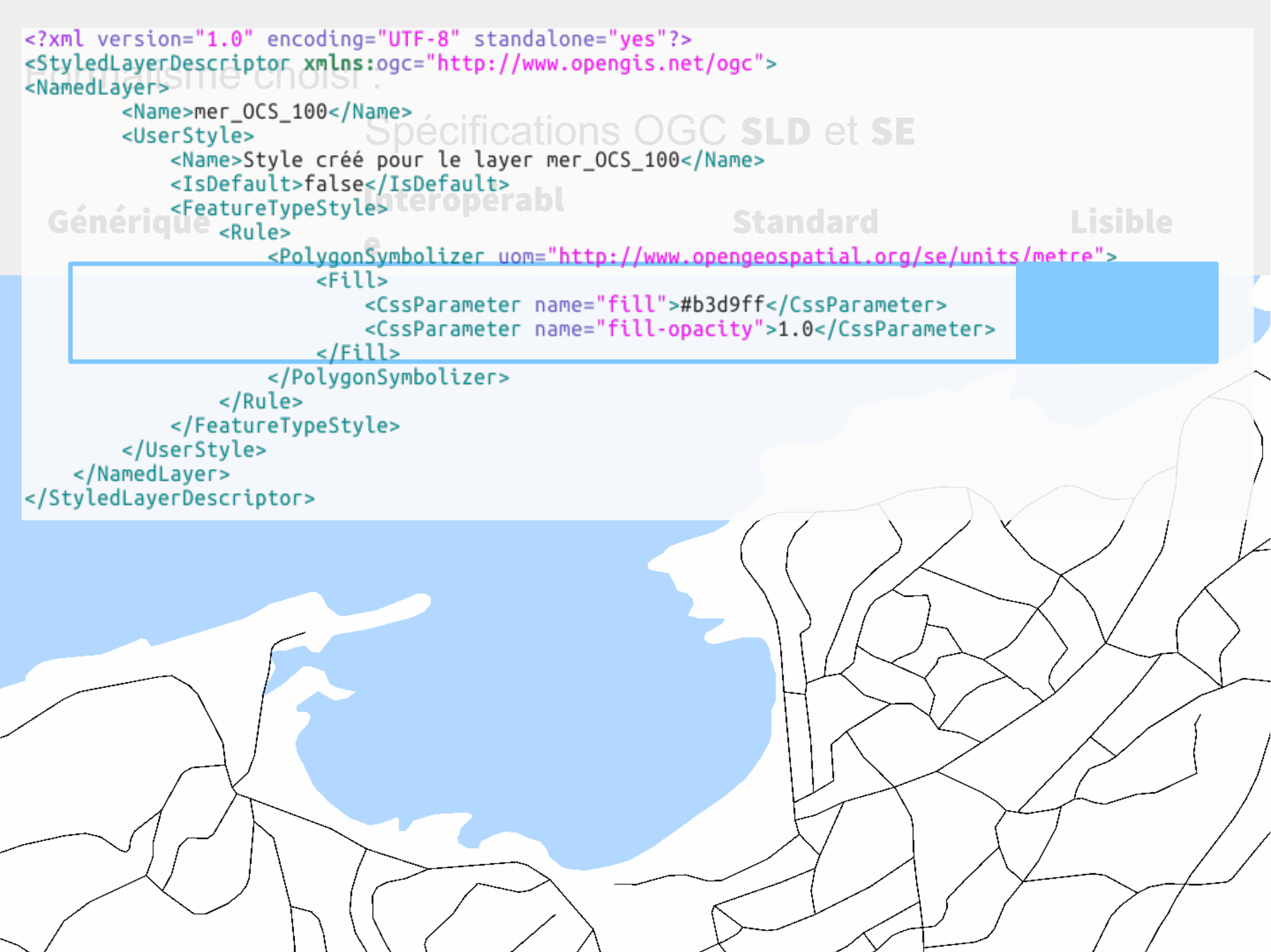
```
<NamedLayer>
      <Name>surface_d_eau_25</Name>
      <UserStyle>
          <Name>Style créé pour le layer surface_d_eau_25</Name>
          <Name>Style créé pour le layer surface_d_eau_25</Name>
          <IsDefault>false</IsDefault>
          <FeatureTypeStyle>
              <Rule>
                  <PolygonSymbolizer uom="http://www.opengeospatial.org/se/units/metre">
                      <Stroke>
                          <CssParameter name="stroke">#B3D9FF</CssParameter>
                          <CssParameter name="stroke-width">1.0</CssParameter>
                          <CssParameter name="stroke-linecap">round</CssParameter>
                      </Stroke>
                      <GeometryPropertyName>geom</GeometryPropertyName>
                      <BlendingMode>Normal</BlendingMode>
                      <Fill>
                          <CssParameter name="fill">#b3d9ff</CssParameter>
                      </Fill>
                  </PolygonSymbolizer>
              </Rule>
          </FeatureTypeStyle>
      </UserStyle>
  </NamedLayer>
  <NamedLayer>
      <Name>troncon_route_25</Name>
      <UserStyle>
          <Name>Style créé pour le layer troncon_route_25</Name>
          <Name>Style créé pour le layer troncon_route_25</Name>
          <IsDefault>false</IsDefault>
          <FeatureTypeStyle>
              <Rule>
                  <Name>Autres routes</Name>
                  <Filter>
                      <Or>
                          <PropertyIsEqualTo matchCase="true">
                              <PropertyName>symbolisat</PropertyName>
                              <Literal>Locale</Literal>
                          </PropertyIsEqualTo>
```

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<StyledLayerDescriptor xmlns:ogc="http://www.opengis.net/ogc">
    <NamedLayer>
        <Name>mer_OCS_100</Name>
        <UserStyle>
            <Name>Style créé pour le layer mer_OCS_100</Name>
            <IsDefault>false</IsDefault>
            <FeatureTypeStyle>
                <Rule>
                    <PolygonSymbolizer uom="http://www.opengeospatial.org/se/units/metre">
                        ...
                    </PolygonSymbolizer>
                </Rule>
            </FeatureTypeStyle>
        </UserStyle>
    </NamedLayer>
</StyledLayerDescriptor>
```

Spécifications OGC **SLD** et **SE**

Générique Standard Lisible

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<StyledLayerDescriptor xmlns:ogc="http://www.opengis.net/ogc">
<NamedLayer>
        <Name>mer_OCS_100</Name>
        <UserStyle>
            <Name>Style créé pour le layer mer_OCS_100</Name>
            <IsDefault>false</IsDefault>
            <FeatureTypeStyle>
                <Rule>
                    <PolygonSymbolizer uom="http://www.opengeospatial.org/se/units/metre">
                        <Fill>
                            <CssParameter name="fill">#b3d9ff</CssParameter>
                            <CssParameter name="fill-opacity">1.0</CssParameter>
                        </Fill>
                    </PolygonSymbolizer>
                </Rule>
            </FeatureTypeStyle>
        </UserStyle>
    </NamedLayer>
</StyledLayerDescriptor>
```

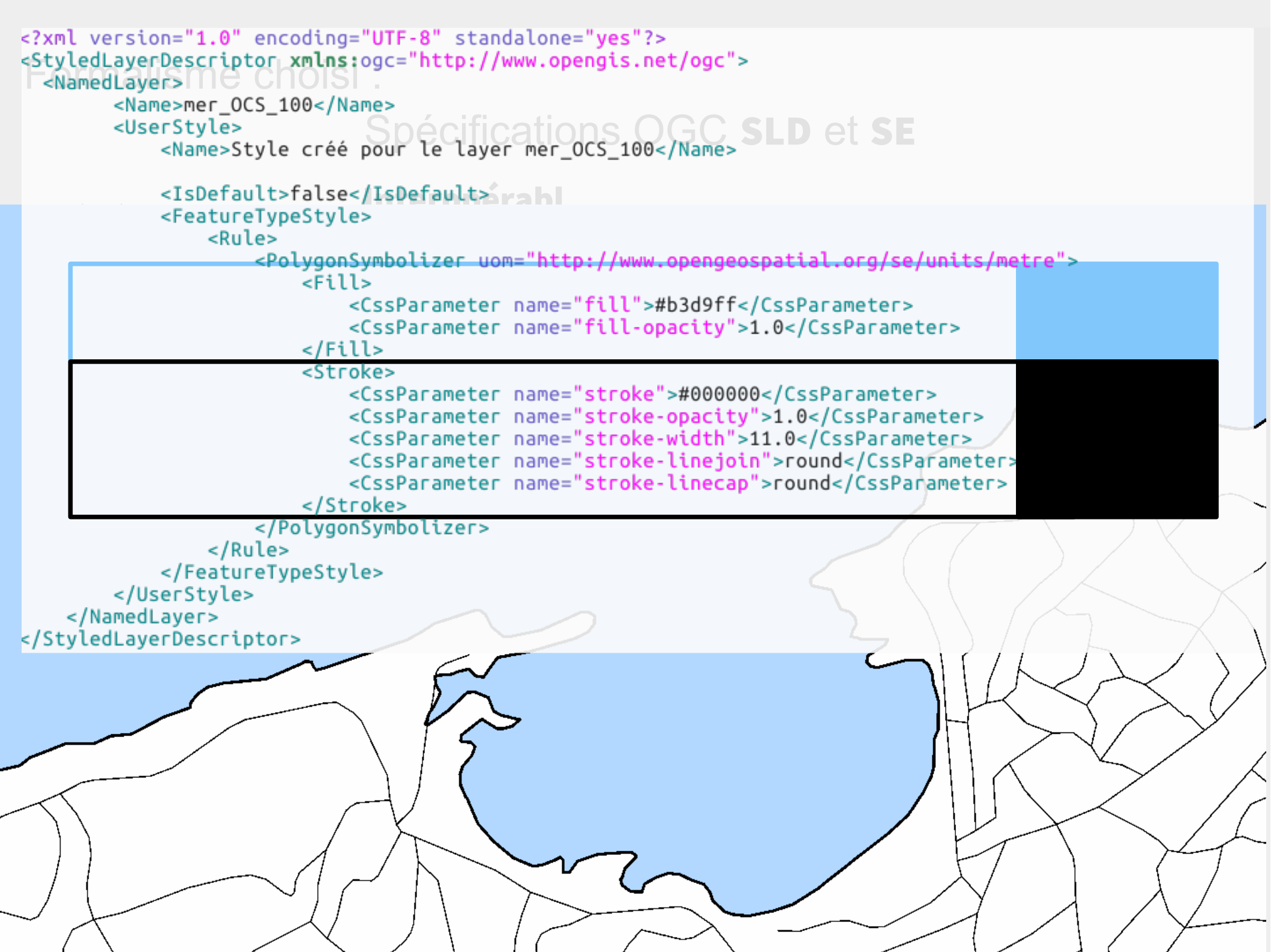


Formalisme choisi :

Spécifications OGC **SLD** et **SE**

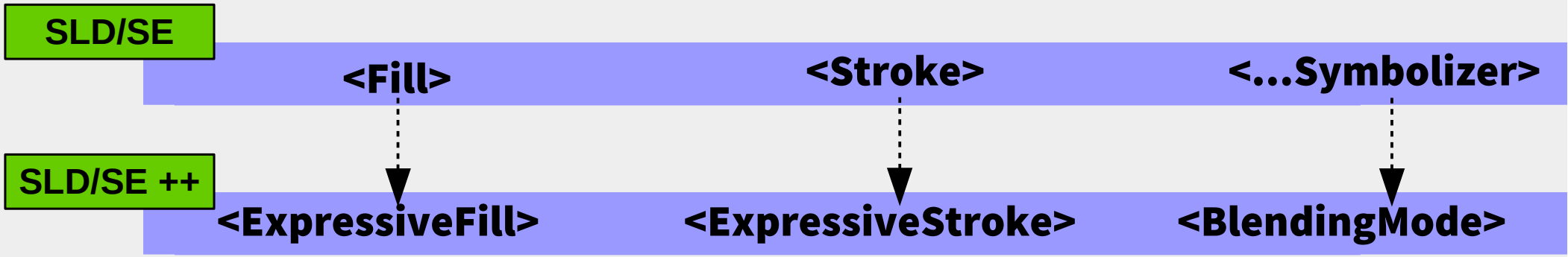
```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<StyledLayerDescriptor xmlns:ogc="http://www.opengis.net/ogc">
  <NamedLayer>
        <Name>mer_OCS_100</Name>
        <UserStyle>
            <Name>Style créé pour le layer mer_OCS_100</Name>

            <IsDefault>false</IsDefault>
            <FeatureTypeStyle>
                <Rule>
                    <PolygonSymbolizer uom="http://www.opengeospatial.org/se/units/metre">
                        <Fill>
                            <CssParameter name="fill">#b3d9ff</CssParameter>
                            <CssParameter name="fill-opacity">1.0</CssParameter>
                        </Fill>
                        <Stroke>
                            <CssParameter name="stroke">#000000</CssParameter>
                            <CssParameter name="stroke-opacity">1.0</CssParameter>
                            <CssParameter name="stroke-width">11.0</CssParameter>
                            <CssParameter name="stroke-linejoin">round</CssParameter>
                            <CssParameter name="stroke-linecap">round</CssParameter>
                        </Stroke>
                    </PolygonSymbolizer>
                </Rule>
            </FeatureTypeStyle>
        </UserStyle>
    </NamedLayer>
</StyledLayerDescriptor>
```



Extension des spécifications SLD / SE

Extension des spécifications SLD / SE



Remplissage de surfaces

```
<Fill>
        <CssParameter name="fill">#ffffff</CssParameter>
        <CssParameter name="fill-opacity">1.0</CssParameter>
        <ExpressiveFill>
                <ExpressiveMethod>CassiniSeaPatches</ExpressiveMethod>
                <ExpressiveParameter name="fill-texture">
                        <TileDistributionTexture XRepeat="false"
                                YRepeat="false">
                                <Displacement x="0.0" y="0.0" />
                                <ScaleFactor x="0.5" y="0.5" />
                                <Rotation Angle="0.0" />
                                <MaxCoastlineLength>3000.0</MaxCoastlineLength>
                                <Tile>
                                        <URI>../images/StJeanDeLuz/mer1.png</URI>
                                        <ScaleFactor>0.5</ScaleFactor>
                                        <MinDistance>0.0</MinDistance>
                                        <MaxDistance>2200.0</MaxDistance>
                                        <InRangeProbability>1.0</InRangeProbability>
                                        <OutOfRangeProbability>0.0</OutOfRangeProbability>
                                </Tile>
                                ...
                                <Resolution>600.0</Resolution>
                                <Blending>ALPHA</Blending>
                                <DistributionManagement>KEEP_OUTSIDE</DistributionManagement>
                                <BlurSize>1</BlurSize>
                        </TileDistributionTexture>
                </ExpressiveParameter>
        </ExpressiveFill>
</Fill>
```

ExpressiveFill

Appel

Paramètres

Stylisation de linéaires

```
<NamedLayer>
    <Name>Routes</Name>
    <UserStyle>
        <Name>Style créé pour le layer Routes</Name>
        <FeatureTypeStyle>
            <Rule>
                <LineSymbolizer uom="http://www.opengeospatial.org/se/units/metre">
                    <Stroke>
                        <CssParameter name="stroke">#bb690c</CssParameter>
                        <CssParameter name="stroke-opacity">1.0</CssParameter>
                        <CssParameter name="stroke-width">100.0</CssParameter>
                        <CssParameter name="stroke-linejoin">round</CssParameter>
                        <CssParameter name="stroke-linecap">round</CssParameter>
                        <ExpressiveStroke>
                            <ExpressiveMethod>DerainStrokePainting</ExpressiveMethod>
                            <ExpressiveParameter name="brushStartWidth">136</ExpressiveParameter>
                            <ExpressiveParameter name="brushEndWidth">135</ExpressiveParameter>
                            <ExpressiveParameter name="transitionSize">5</ExpressiveParameter>
                            <ExpressiveParameter name="brushRoughness">4.5</ExpressiveParameter>
                            <ExpressiveParameter name="strokePressure">6</ExpressiveParameter>
                            <ExpressiveParameter name="strokeSoftness">0.4</ExpressiveParameter>
                            <ExpressiveParameter name="extremitiesLength">210</ExpressiveParameter>
                            <ExpressiveParameter name="paperReferenceMapScale">100000</ExpressiveParameter>
                            <ExpressiveParameter name="paperSizeInCm">4</ExpressiveParameter>
                            <ExpressiveParameter name="paperRoughness">6</ExpressiveParameter>
                            <ExpressiveParameter name="paperTexture">
                                <SimpleTexture>
                                    <URI>../images/canvas-normalized.png</URI>
                                </SimpleTexture>
                            </ExpressiveParameter>
                            <ExpressiveParameter name="brushTexture">
                                <SimpleTexture>
                                    <URI>../images/pencil1-tiled-136-135.png</URI>
                                </SimpleTexture>
                            </ExpressiveParameter>
                        </ExpressiveStroke>
                    </Stroke>
                    <GeometryPropertyName>geom</GeometryPropertyName>
                    <PerpendicularOffset>0.0</PerpendicularOffset>
                </LineSymbolizer>
            </Rule>
        </FeatureTypeStyle>
    </UserStyle>
</NamedLayer>
```

ExpressiveStroke

Appel

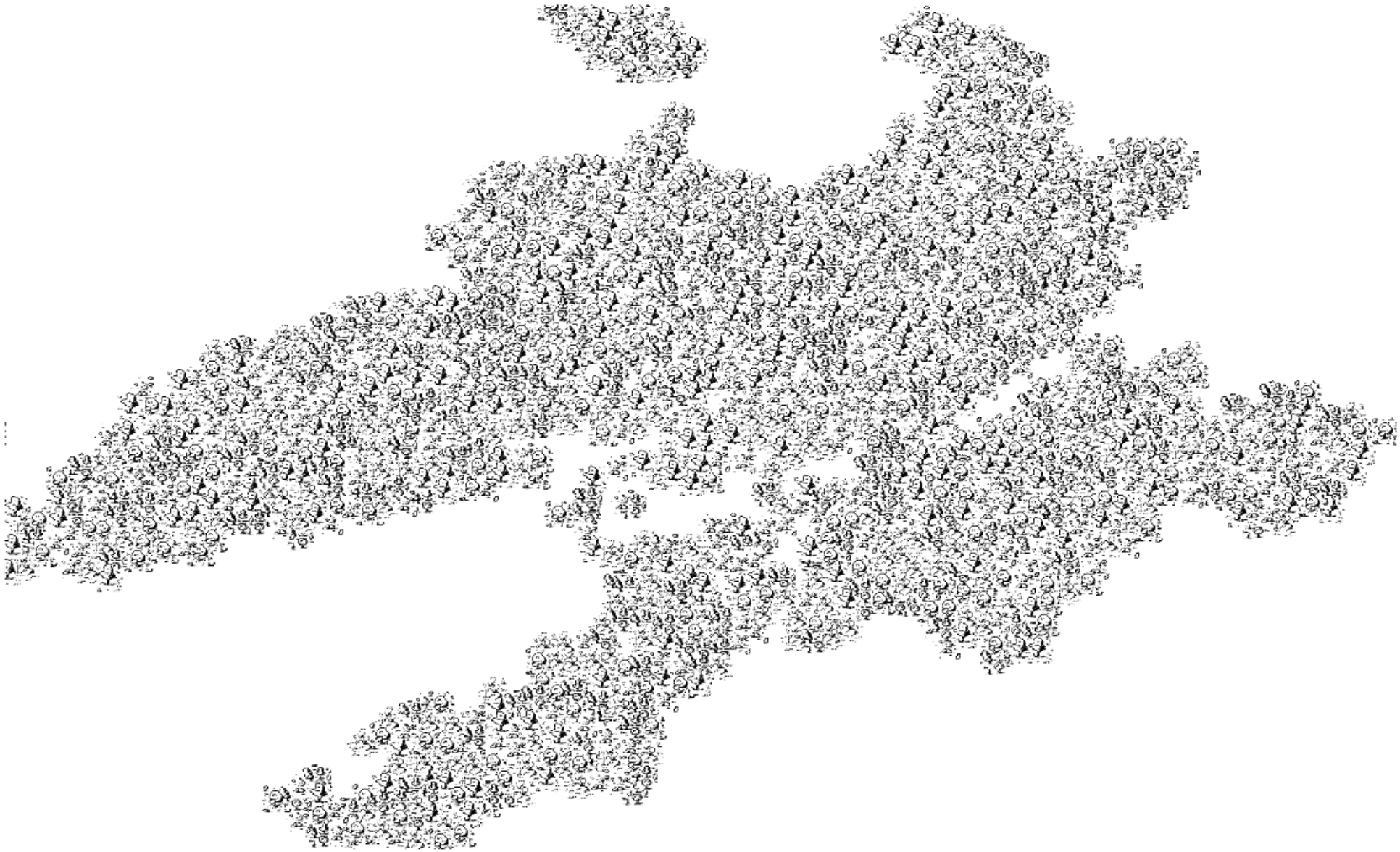
Paramètres

Modes de mélange

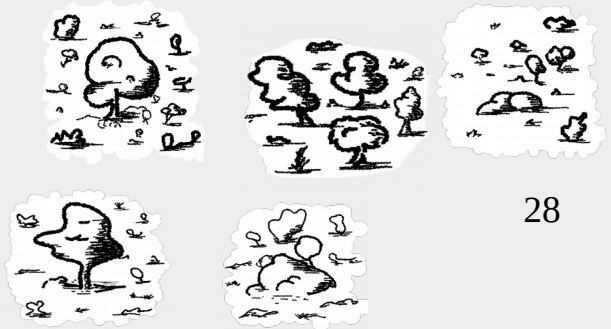
```
<NamedLayer>
    <Name>vegetation_OCS_100</Name>
    <UserStyle>
        <Name>Style créé pour le layer vegetation_OCS_100</Name>
        <FeatureTypeStyle>
            <Rule>
                <LegendGraphic>
                </LegendGraphic>
                <PolygonSymbolizer uom="http://www.opengeospatial.org/se/units/metre">
                    <Stroke>
                        <CssParameter name="stroke">#000000</CssParameter>
                        <CssParameter name="stroke-opacity">0.0</CssParameter>
                        <CssParameter name="stroke-width">23.0</CssParameter>
                        <CssParameter name="stroke-linecap">round</CssParameter>
                    </Stroke>
                    <GeometryPropertyName>geom</GeometryPropertyName>
                    <Fill>
                        <CssParameter name="fill">#ffffff</CssParameter>
                        <CssParameter name="fill-opacity">1.0</CssParameter>
                    </Fill>
                    <BlendingMode>Overlay</BlendingMode>
                </PolygonSymbolizer>
            </Rule>
        </FeatureTypeStyle>
    </UserStyle>
</NamedLayer>
```

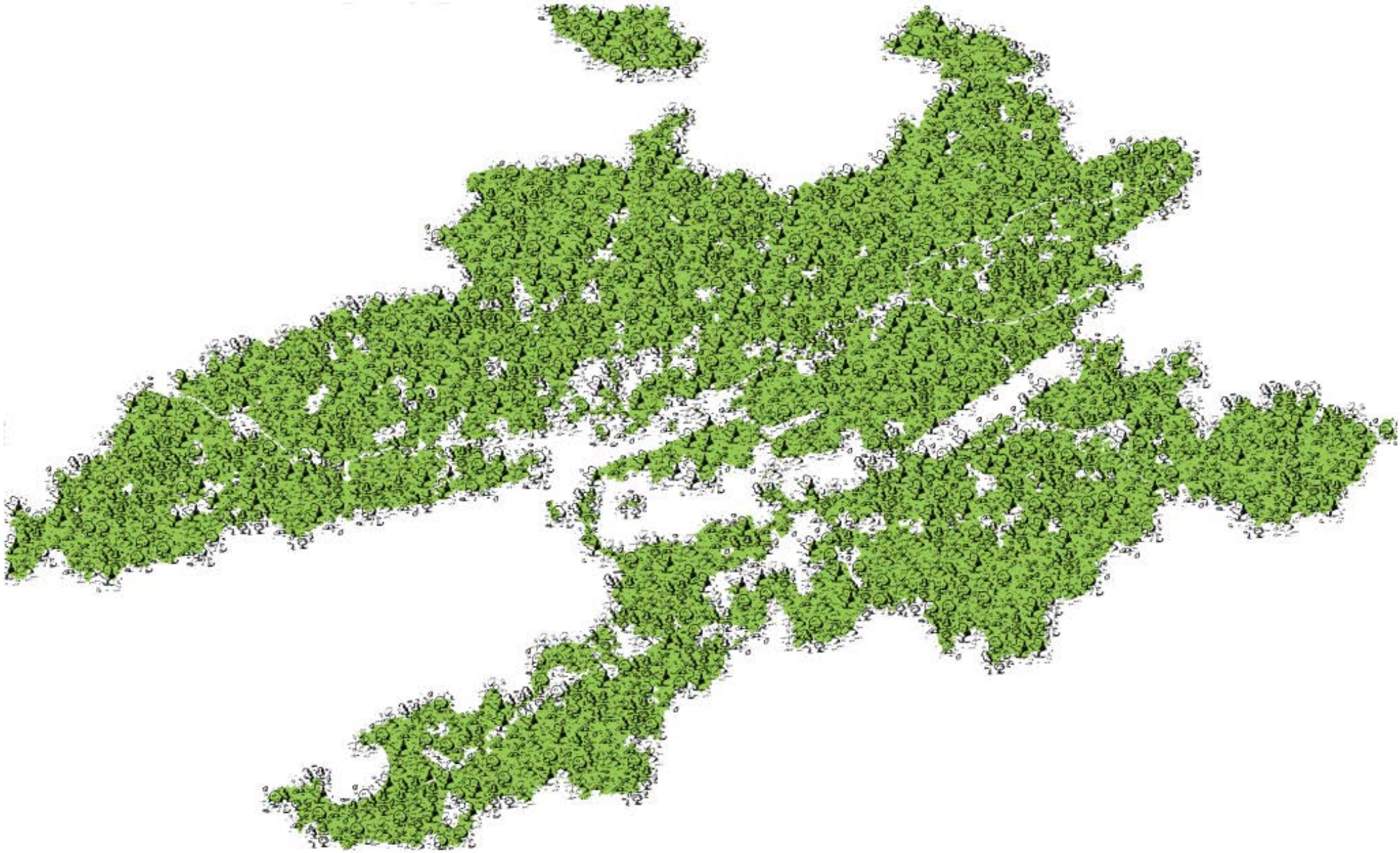
Mode de mélange

Un exemple

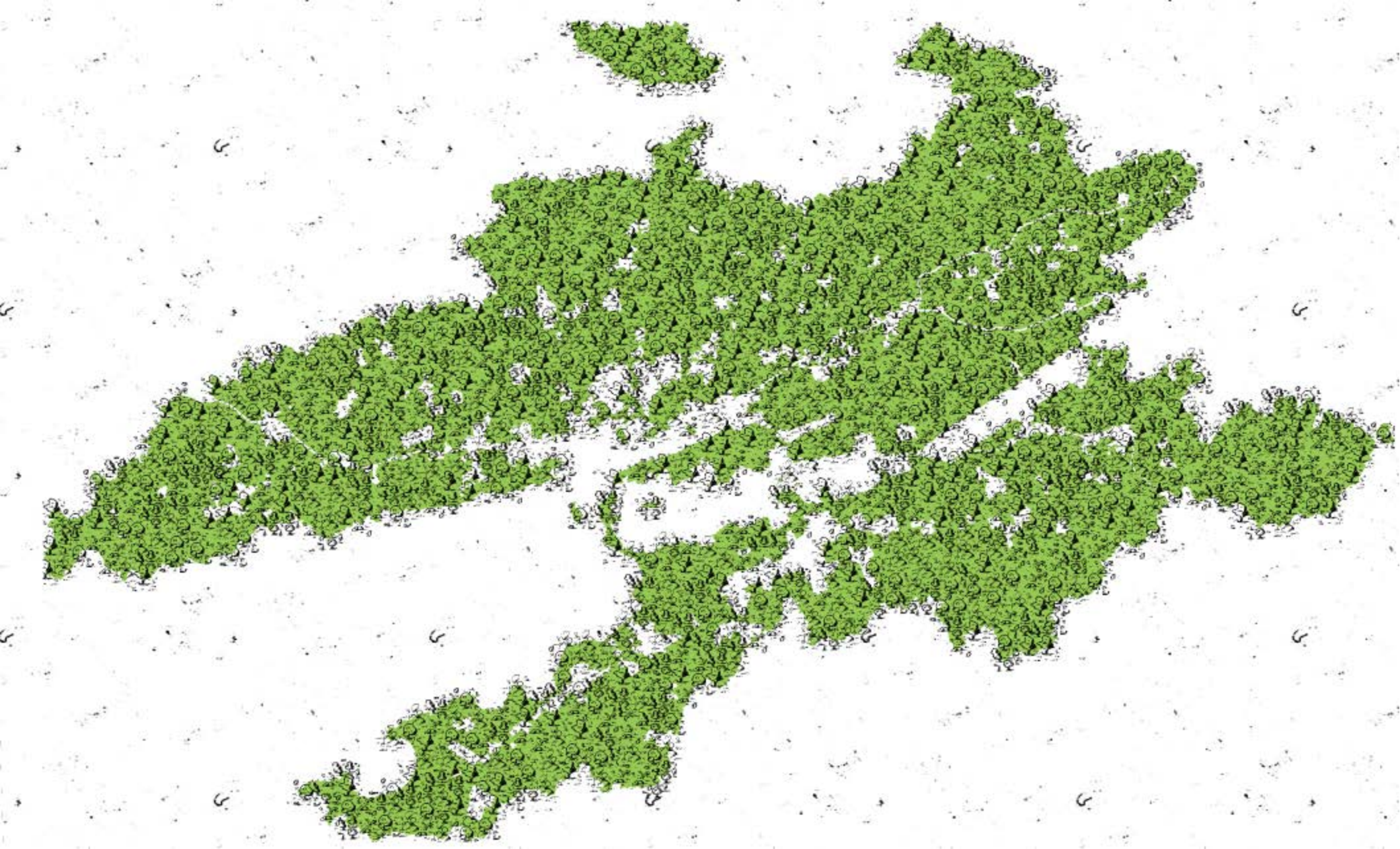


<ExpressiveFill> + méthodes de remplissage par patches

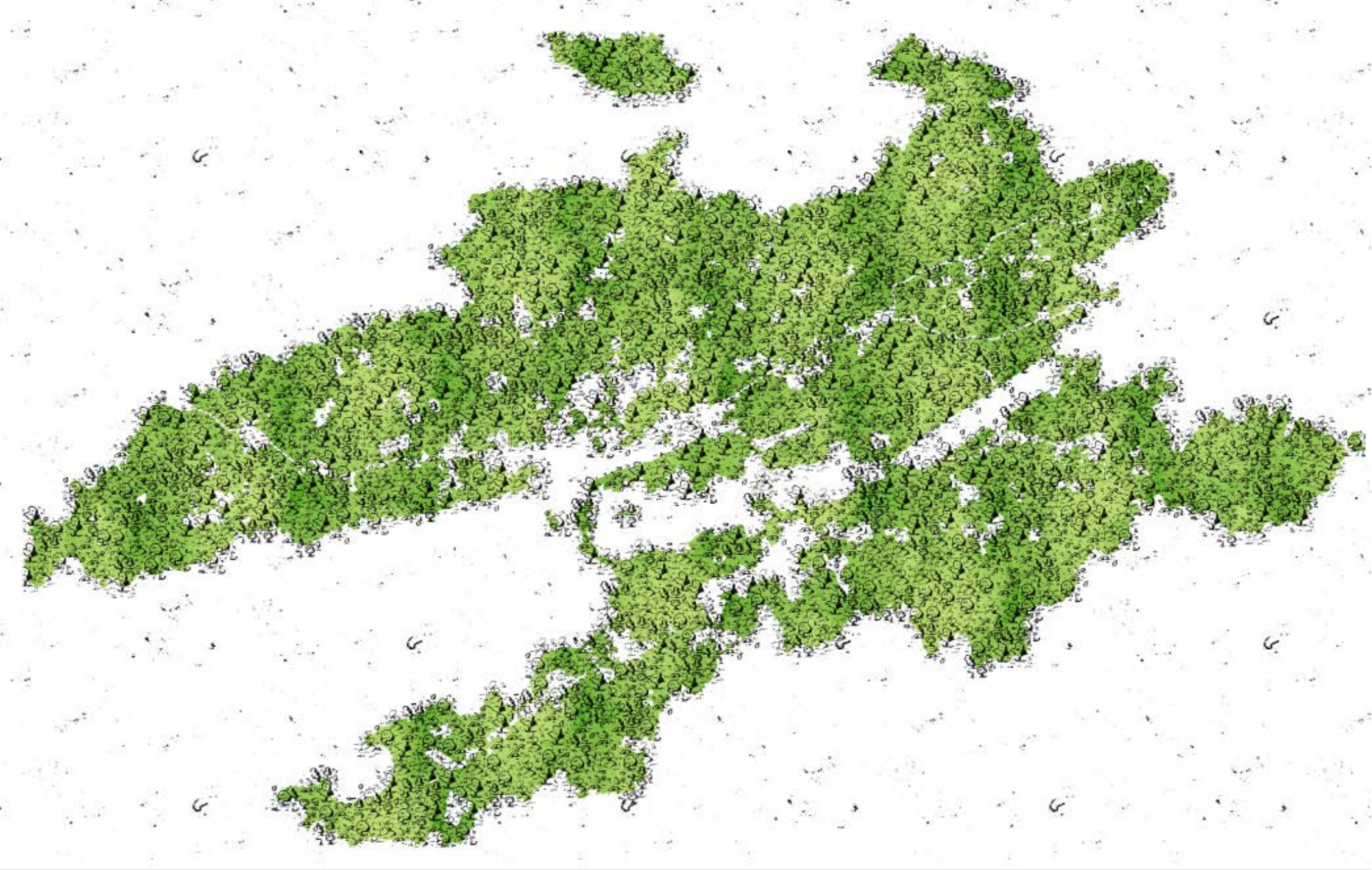


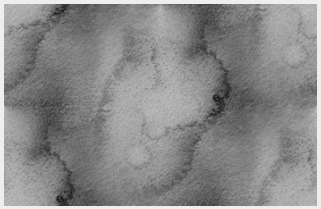


<Fill> standard + <BlendingMode> Multiply



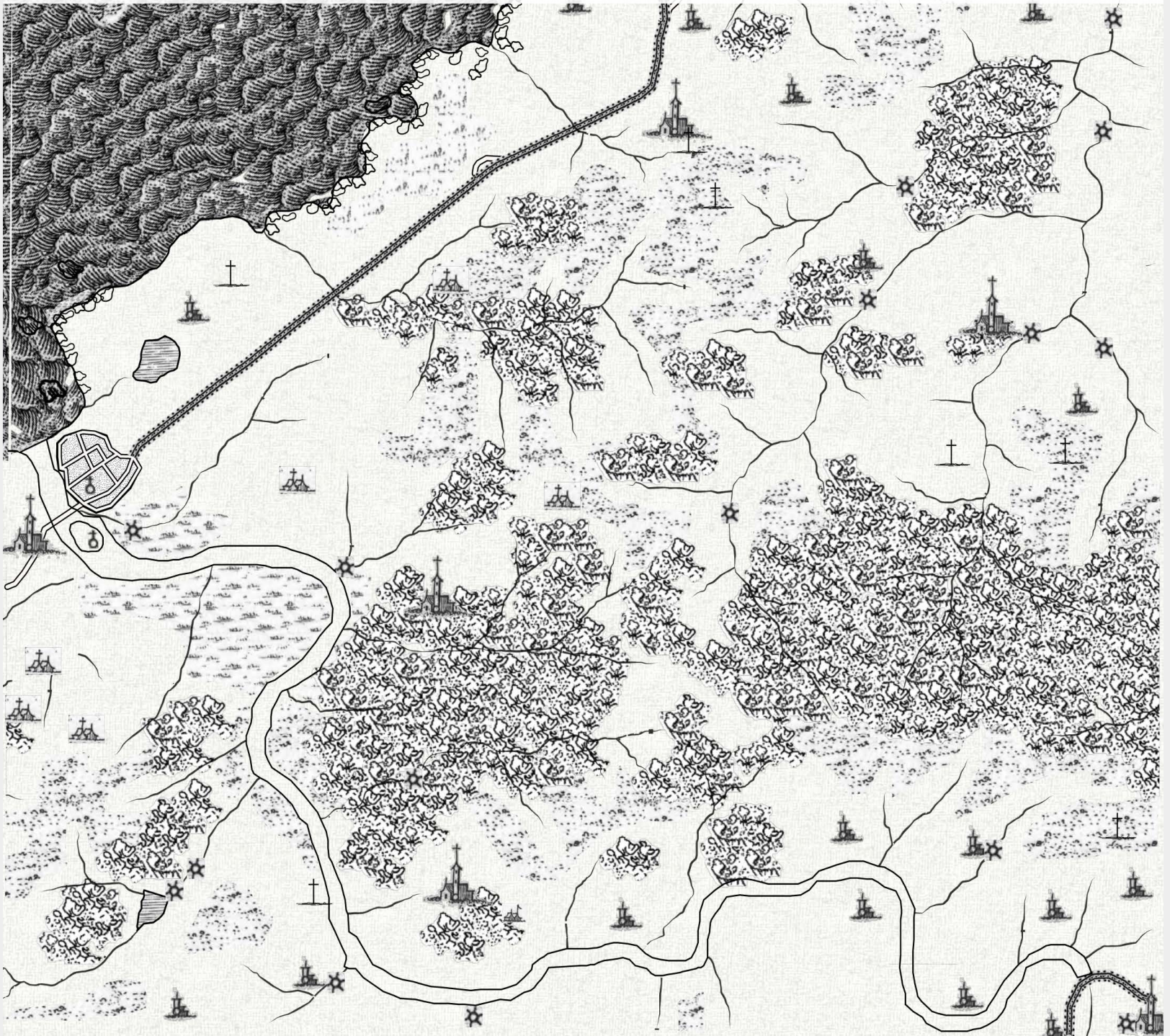
<Fill>  **+ <BlendingMode> Multiply**



<Fill>  **+ <BlendingMode> Overlay**

Cartes

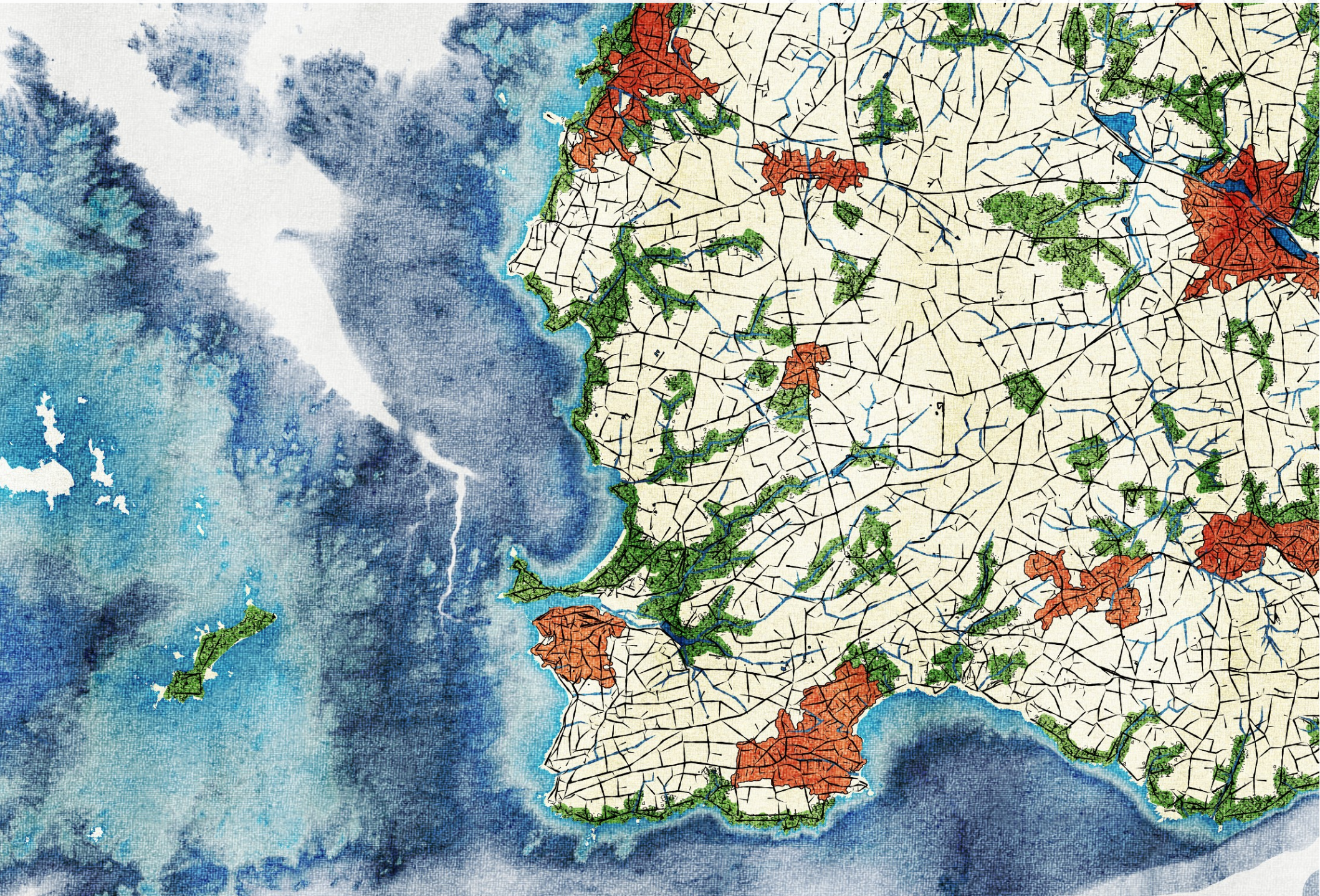
Style ‘’Cassini’’, données GeoHistoricaData [NPAR2016]



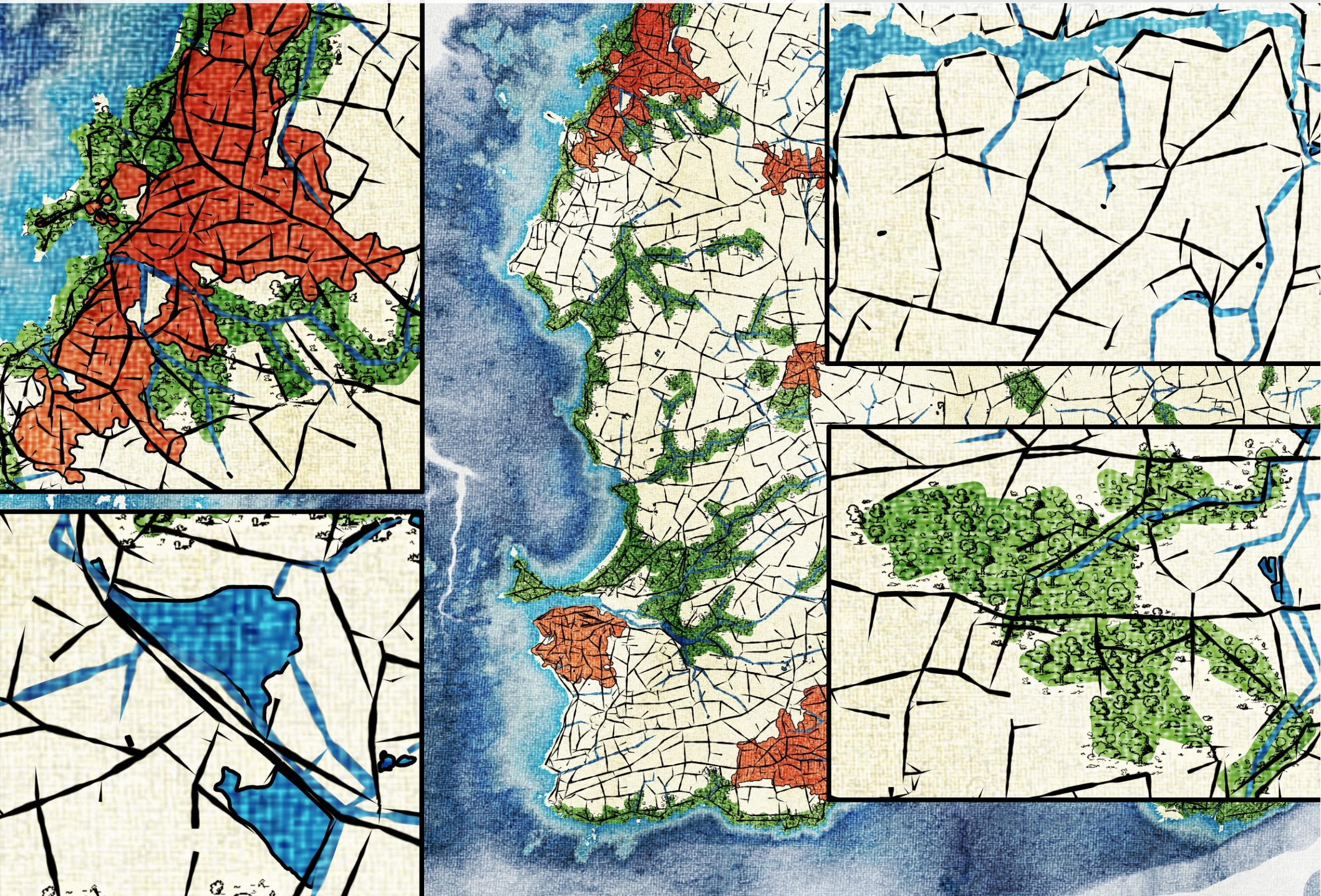
Style ‘’Cassini’’, données ScanExpress 1 : 100 000

Style ‘’Aquarelle’’ [NPAR2016]

Style ‘’Estampe’’



Style ‘’Estampe”



Démo à la pause...

MERCI !

[NPAR2016]

Christophe S., Dumenieu B., Turbet J., Hoarau C., Mellado N., Ory J., Loi H., Masse A., Arbelot B., Vergne R., Brédif M., Hurtut T., Thollot J., Vanderhaeghe D. (2016).
Map Style Formalization: Rendering Techniques Extension for Cartography, Pierre Bénard; Holger Winnemöller.
Expressive 2016 The Joint Symposium on Computational Aesthetics and Sketch-Based Interfaces and Modeling and Non-Photorealistic Animation and Rendering, May 2016, Lisbonne, Portugal.
The Eurographics Association, Non-Photorealistic Animation and Rendering.


N