

Ventajas de la conexión a bases de datos H2 desde gvSIG



H2

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- Base de datos SQL
- Consola basada en navegador
- Java
- Open source
- JDBC



Features

	H2	Derby	HSQLDB	MySQL	PostgreSQL
Pure Java	Yes	Yes	Yes	No	No
Memory Mode	Yes	Yes	Yes	No	No
Encrypted Database	Yes	Yes	Yes	No	No
ODBC Driver	Yes	No	No	Yes	Yes
Fulltext Search	Yes	No	No	Yes	Yes
Multi Version Concurrency	Yes	No	Yes	Yes	Yes
Footprint (jar/dll size)	~1 MB	~2 MB	~1 MB	~4 MB	~6 MB

See also the [detailed comparison](#).

<http://www.h2database.com/html/main.html>

- Extensión Espacial de la base de datos H2
- Añadir funcionalidades espaciales
- Respecta estándares OGC: “*OGC's Simple Features for SQL*”

“H2GIS is to H2 as PostGIS is to PostgreSQL.”



<http://www.h2gis.org/>

- Soporte para geometrías
 - (Multi) Point
 - (Multi) Linestring
 - (Multi) Polygon
- Funciones de análisis
 - H2Network



<http://www.h2gis.org/>

- Producto que sigue en desarrollo



H2GIS 1.3.2 Released

RELEASE

11 Oct 2017

 gpetit

H2GIS version 1.3.2 use H2 version 1.4.196 and JTS version 1.14.

Change log

Bugs

- Fix Invalid cost of PK Index,
- Fix on geojson driver.

Enhancements

- Add support to 2008 and RFC 7946 specification for GeoJson driver,
- Update H2 database to 1.4.196.

<http://www.h2gis.org/>

- Documentación disponible

GETTING STARTED

Welcome
Quick-start guide
Drivers
Spatial indices
Spatial JDBC
Custom function aliases
Embedded database
Functions

GEOMETRY 2D

Affine transformations
Convert geometries
Create geometries
Edit geometries
Measures
Operators
Predicates
Process geometries
Projections
Properties
Trigonometry

GEOMETRY 3D

Convert geometries
Create geometries
Edit geometries
Measures
Properties
Topography
Triangulation

RASTER**SYSTEM****APPLICATIONS**

H2Network



- Indices espaciales
 - CREATE SPATIAL INDEX [index_name] ON table_name(geometry_column);

<http://www.h2gis.org/>

- Trabajo con datos



CSVWrite	Table → CSV
DBFRead	DBF → Table
DBFWrite	Table → DBF
FILE_TABLE	Link a table to a file
GPXRead	GPX → Table
GeoJsonRead	GeoJSON → Table
GeoJsonWrite	Table → GeoJSON
KMLWrite	KML, KMZ → Table
OSMRead	OSM → Table
SHPRead	SHP → Table
SHPWrite	Table → SHP

<http://www.h2gis.org/>

- Trabajo con geometrías: 2D y 3D



Create geometries

The following geometry creation functions are available:

FUNCTION
<code>ST_Accum</code>
<code>ST_BoundingCircle</code>
<code>ST_Collect</code>
<code>ST_Expand</code>
<code>ST_MakeEllipse</code>
<code>ST_MakeEnvelope</code>
<code>ST_MakeGrid</code>
<code>ST_MakeGridPoints</code>

Predicates

The following predicate functions are available:

FUNCTION	DESCRIPTION
<code>ST_Contains</code>	Returns true if A contains Geometries B
<code>ST_Covers</code>	Returns true if A covers B
<code>ST_Crosses</code>	Returns true if A crosses B
<code>ST_DWithin</code>	Returns true if two geometries are within a specified distance of one another
<code>ST_Disjoint</code>	Returns true if Geometries A and B are disjoint
<code>ST_EnvelopesIntersect</code>	Returns true if the envelope of Geometry A intersects the envelope of Geometry B

Process geometries

The following functions are available to process geometries:

FUNCTION	DESCRIPTION
<code>ST_LineIntersector</code>	Split an input <code>LINESTRING</code> with another geometry
<code>ST_LineMerge</code>	Merges a collection of linear components to form maximal-length <code>LINESTRING</code>
<code>ST_MakeValid</code>	Make a Geometry valid
<code>ST_Polygonize</code>	Create a <code>MULTIPOLYGON</code> from edges of Geometries
<code>ST_PrecisionReducer</code>	Reduce a Geometry's precision

<http://www.h2gis.org/>

- Otras funcionalidades



Topography

The following topography functions are:

FUNCTION	
<code>ST_TriangleAspect</code>	Return the aspect of a triangle.
<code>ST_TriangleContouring</code>	Split triangulation according to contouring.
<code>ST_TriangleDirection</code>	Compute the direction of a triangle.
<code>ST_TriangleSlope</code>	Compute the slope percentage of a triangle.
<code>ST_Voronoi</code>	Create a Voronoi diagram.

Triangulation

The following triangulation functions are available:

FUNCTION	DESCRIPTION
<code>ST_ConstrainedDelaunay</code>	Compute a constrained Delaunay triangulation based on a geometry.
<code>ST_Delaunay</code>	Compute a Delaunay triangulation based on points.
<code>ST_Tessellate</code>	Tessellate a set of Polygon with adaptive triangles.

<http://www.h2gis.org/>

- H2Network



Applications

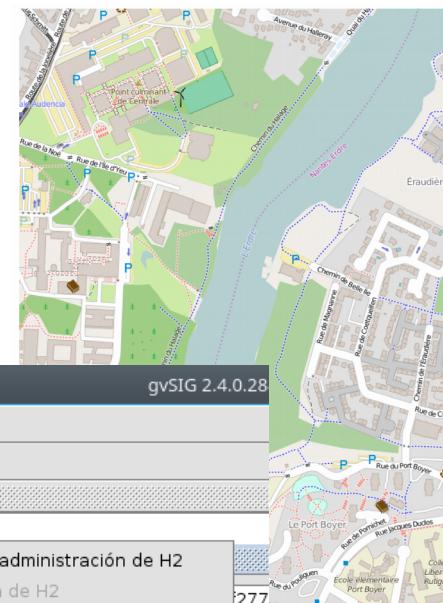
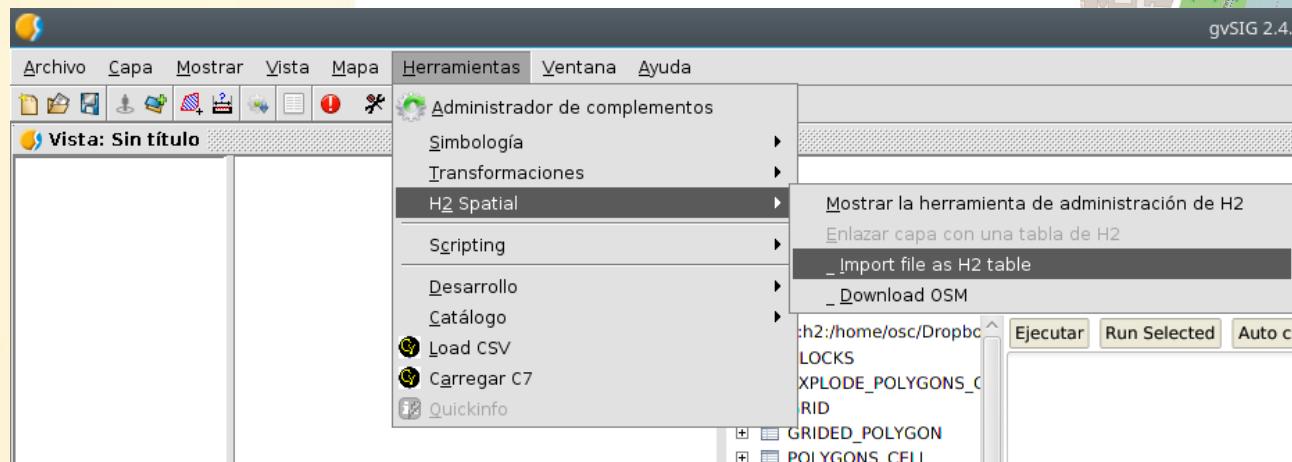
FUNCTION	DESCRIPTION
<code>ST_Accessibility</code>	Calculate, from each vertex, the (distance to the) closest destination
<code>ST_ConnectedComponents</code>	Calculate the (strongly) connected components of a graph
<code>ST_Graph</code>	Produce nodes and edges tables from an input table containing (MULTI)LINESTRINGS
<code>ST_GraphAnalysis</code>	Calculate closeness/betweenness centrality of vertices and edges
<code>ST_ShortestPath</code>	Calculate shortest path(s) between vertices in a graph
<code>ST_ShortestPathLength</code>	Calculate length(s) of shortest path(s) and distance matrices
<code>ST_ShortestPathTree</code>	Calculate shortest path tree from a vertex

<http://www.h2gis.org/>

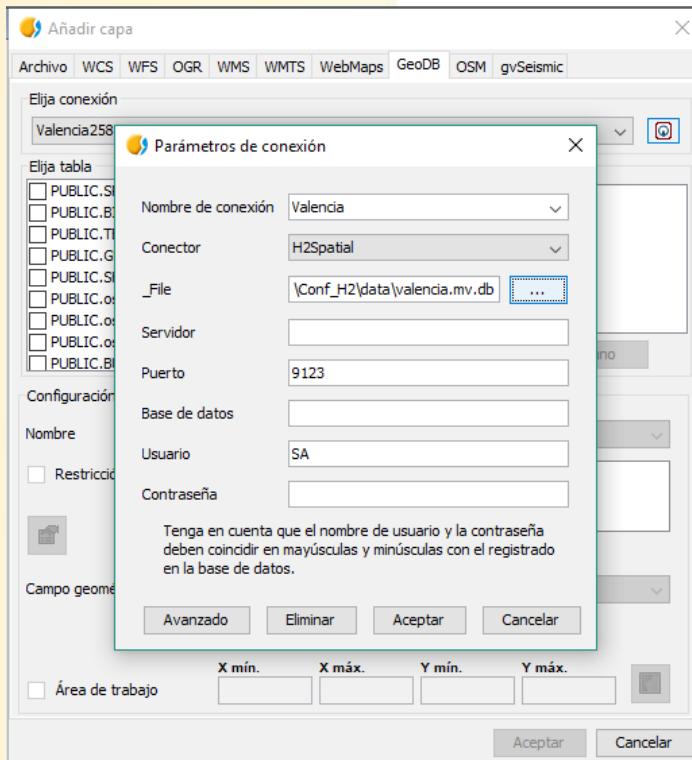
- ST_OSMDownloader



```
CALL ST_OSMDownloader('POLYGON((-1.55 47.24, -1.55 47.25,
-1.54 47.25, -1.54 47.24,
-1.55 47.24))'::geometry,
'/your_url/test.osm');
CALL OSMRead('/your_url/test.osm');
```



- Base de datos de fichero único



 riesgo1_simpli.shx	17/10/2017 5:22	Archivo SHX	1 KB
 valencia.mv.db	17/10/2017 7:00	Data Base File	172.256 KB
 valencia.mv.db.mv.db	19/10/2017 7:08	Data Base File	56 KB
 valencia.osm	16/10/2017 7:54	OpenStreetMap d...	15.844 KB

- Abrir conexión con H2GIS



→

Añadir capa

Archivo WCS WFS OGR WMS WMPS WebMaps GeoDB OSM gvSeismic

Elija conexión
Valencia258

Parámetros de conexión

Nombre de conexión: Valencia
Conector: H2Spatial
_File: \Conf_H2\data\valencia.mv.db
Servidor:
Puerto: 9123
Base de datos:
Usuario: SA
Contraseña:
Tenga en cuenta que el nombre de usuario y la contraseña deben coincidir en mayúsculas y minúsculas con el registrado en la base de datos.

Avanzado Eliminar Aceptar Cancelar

X min. X máx. Y min. Y máx.

Área de trabajo Aceptar Cancelar

Añadir capa

Archivo WCS WFS OGR WMS WMPS WebMaps GeoDB OSM

Elija conexión
Valencia

Elija tabla

PUBLIC.WATER_VORONOI
PUBLIC.roads
PUBLIC.TEST_EDGES
PUBLIC.POLYGON_EDGES_NODE_CC
PUBLIC.riesgo
PUBLIC.WATER_SKEL_SIMPLE
PUBLIC.schools
PUBLIC.BLOCKS
PUBLIC.TEST

Columnas de la tabla

GID [Integer]
THE_GEM [Geometry]
SURFACE [Double]

Todos Ninguno

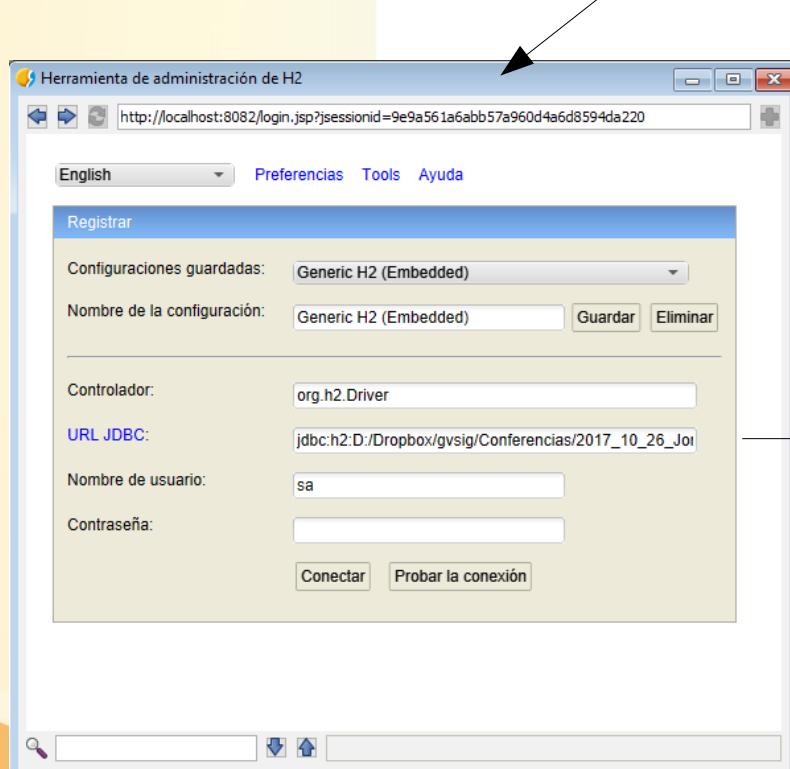
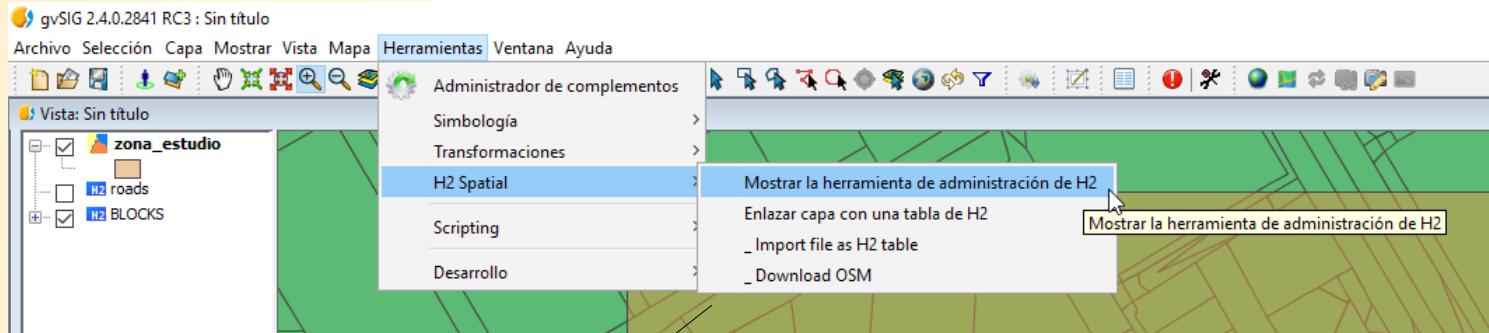
Configuración de tabla

Nombre: BLOCKS Campo ID: {GID}
Restricción SQL:

Campo geométrico: THE_GEM
Proyección actual: EPSG:25830
Área de trabajo X min. X máx. Y min. Y máx.

Aceptar Cancelar

- Administrar base de datos



Arrows from the gvSIG interface point to the 'Herramienta de administración de H2' window, indicating the integration between the two applications.

Herramienta de administración de H2

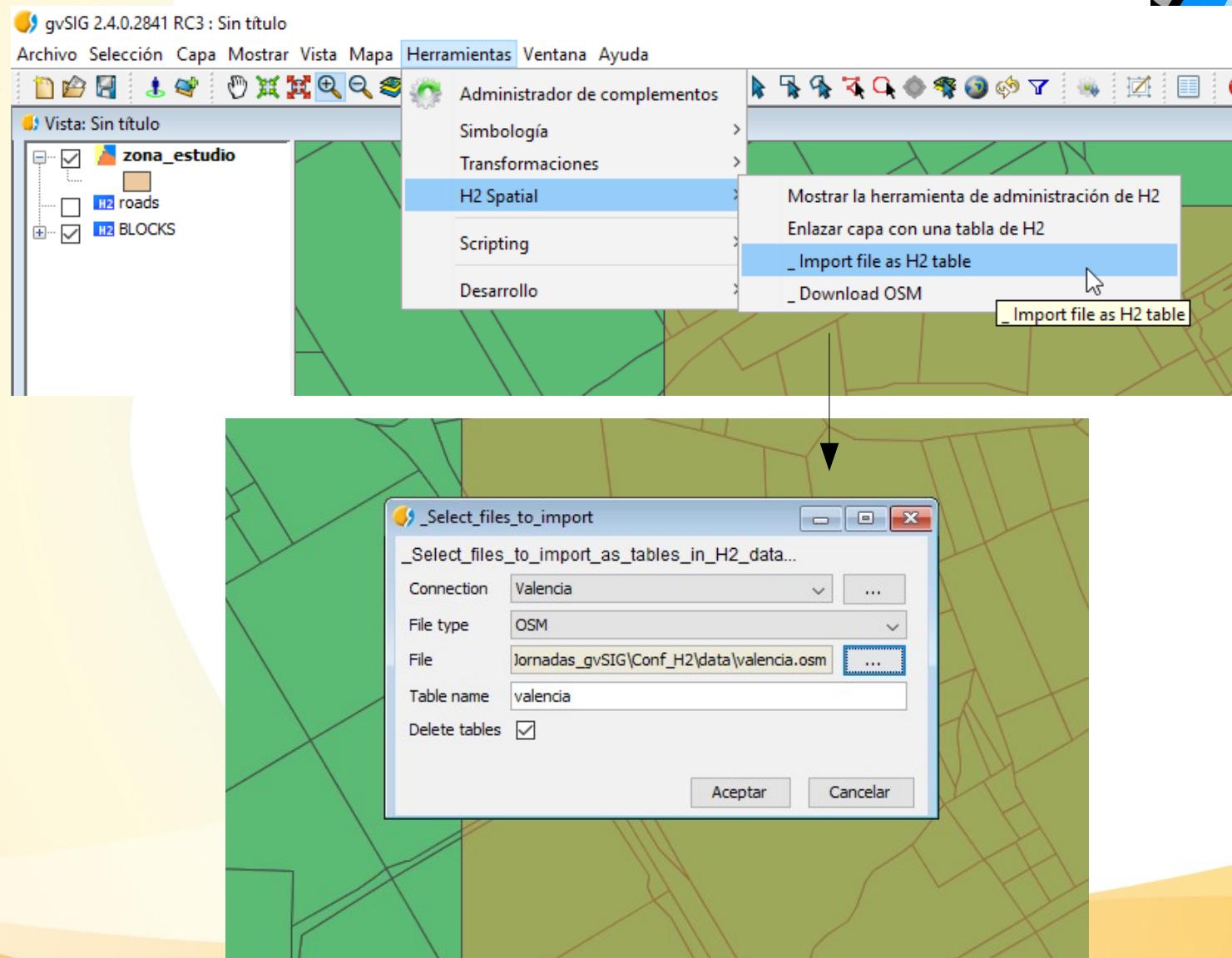
http://localhost:8082/login.do?jsessionid=ed3023afc70981f51998f6940316df18

Auto commit | Número máximo de filas: 1000 | Ejecutar | Run Selected | Auto completado | Eliminar | Instrucción SQL:

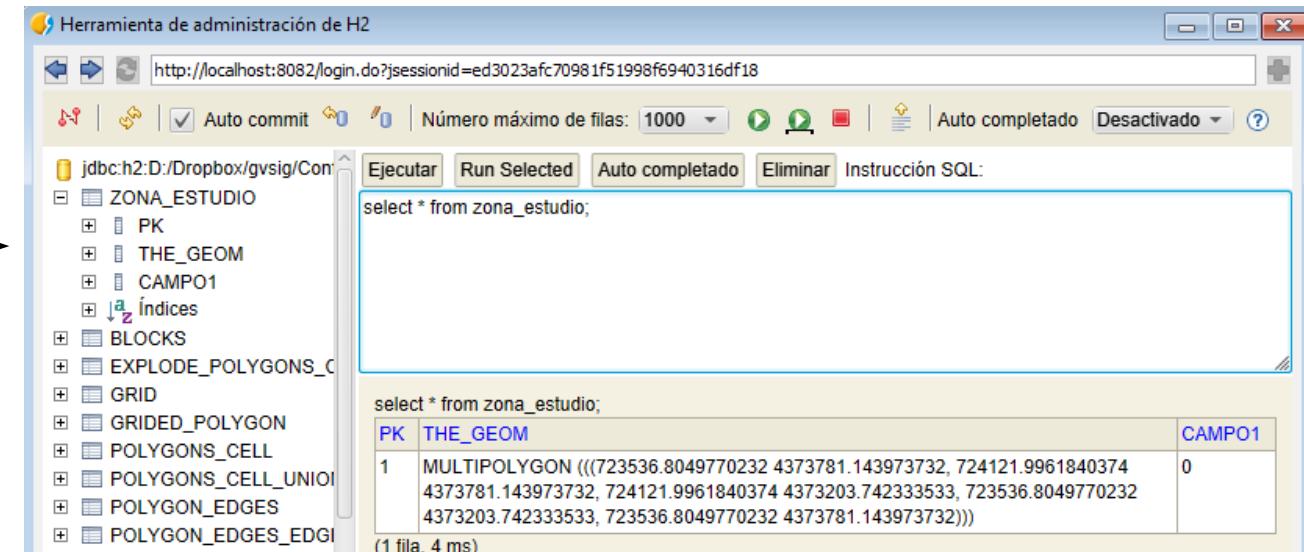
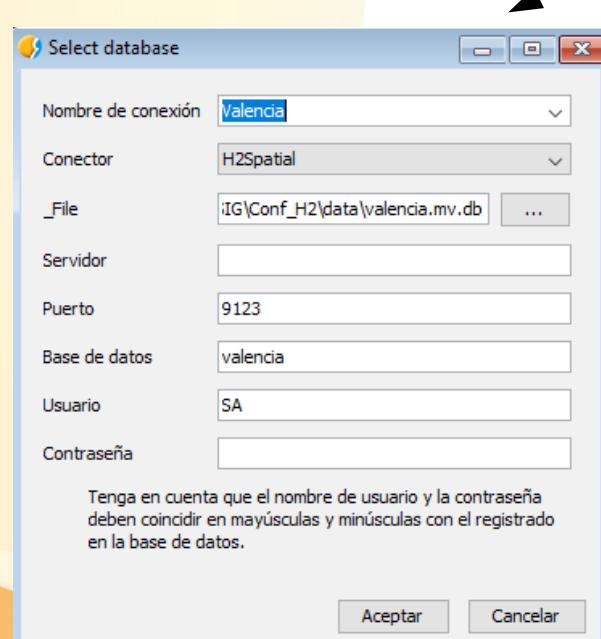
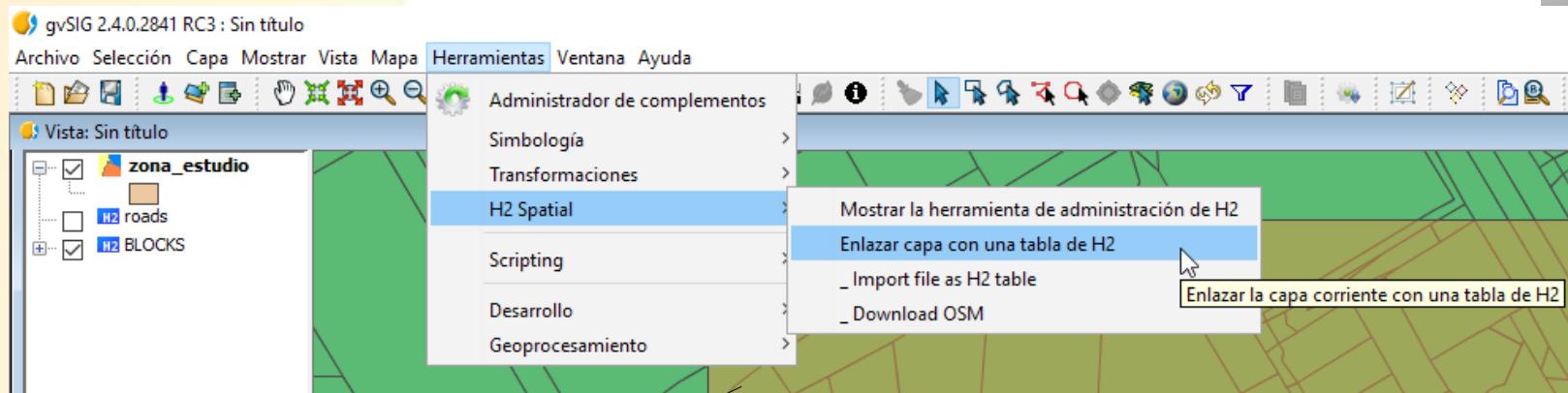
```
select * from "schools";
```

equipamien	identifica	idclase	codvia	numportal	idsubclase	telefono	geometry
CENTRO DE EDUCACIÓN INFANTIL MINI-POLI	009294	7	18390	37	24	627447778	POINT (724091.6054371918.99)
CENTRO DE EDUCACIÓN INFANTIL COTÓ	007724	7	59760	6	24		POINT (726049.2074373936.12)
CENTRO DE EDUCACIÓN INFANTIL SUPERFRIENDS	009379	7	14730	56	24	626448823	POINT (727540.1114372279.70)
CENTRO DE EDUCACIÓN INFANTIL GUPPYDOS	009381	7	25050	38	25	963525863	POINT (726411.1224371325.45)

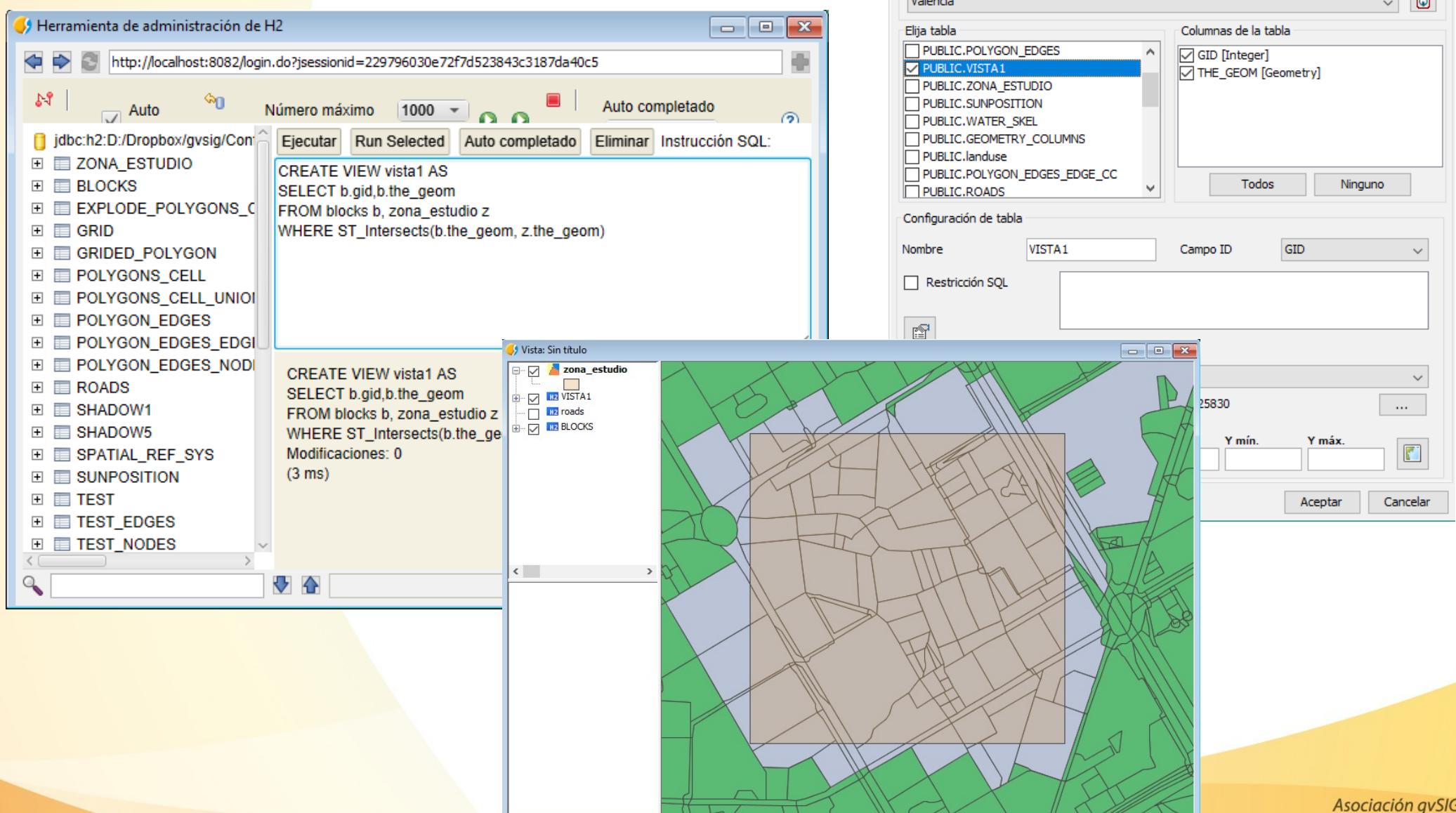
- Importación de capas



- Enlace de capas



- Creación de Vistas



The screenshot illustrates the integration of H2GIS into the gvSIG environment. It shows three main windows:

- Herramienta de administración de H2**: A database management tool window showing an SQL query to create a view named "vista1". The query selects "b.gid, b.the_geom" from the "blocks" table "b" and the "zona_estudio" table "z", where they intersect. The results show the creation of "vista1" and its execution time (3 ms).
- Vista: Sin título**: A map viewer window displaying a geographic area with various layers, including "zona_estudio", "VISTA1", "roads", and "BLOCKS". A specific area is highlighted in brown.
- Añadir capa**: A dialog box for adding a layer. It shows a list of tables from the "Valencia" connection, with "PUBLIC.VISTA1" selected. It also displays the columns "GID [Integer]" and "THE_GEOM [Geometry]".

- Geoprocessos

Área de influencia

Parámetros Región de análisis

Entrada
VISTA1

Opciones

Área definida por un campo en metros
GID

Área definida por una distancia en metros
0.0

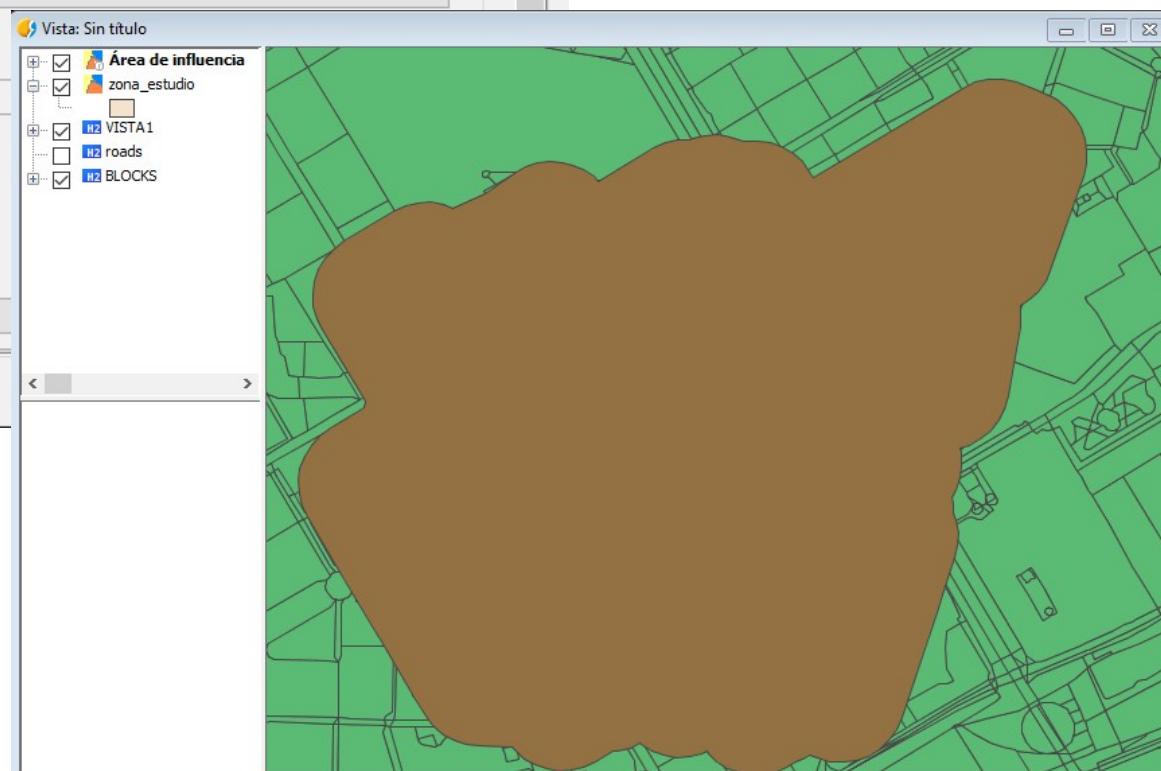
Geometrías seleccionadas

Disolver entidades (solo un anillo)

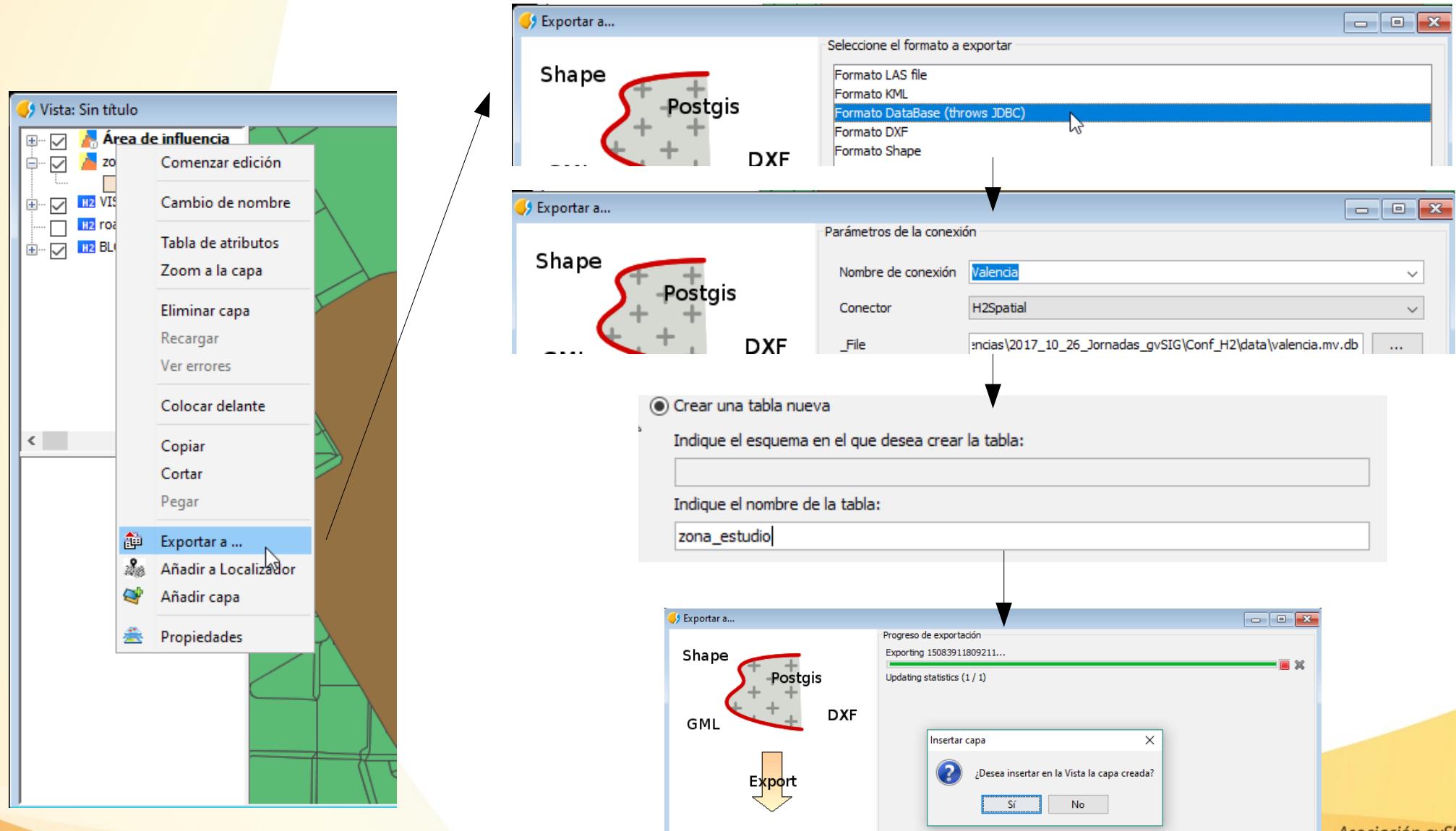
Borde redondeado

Fuera del polígono

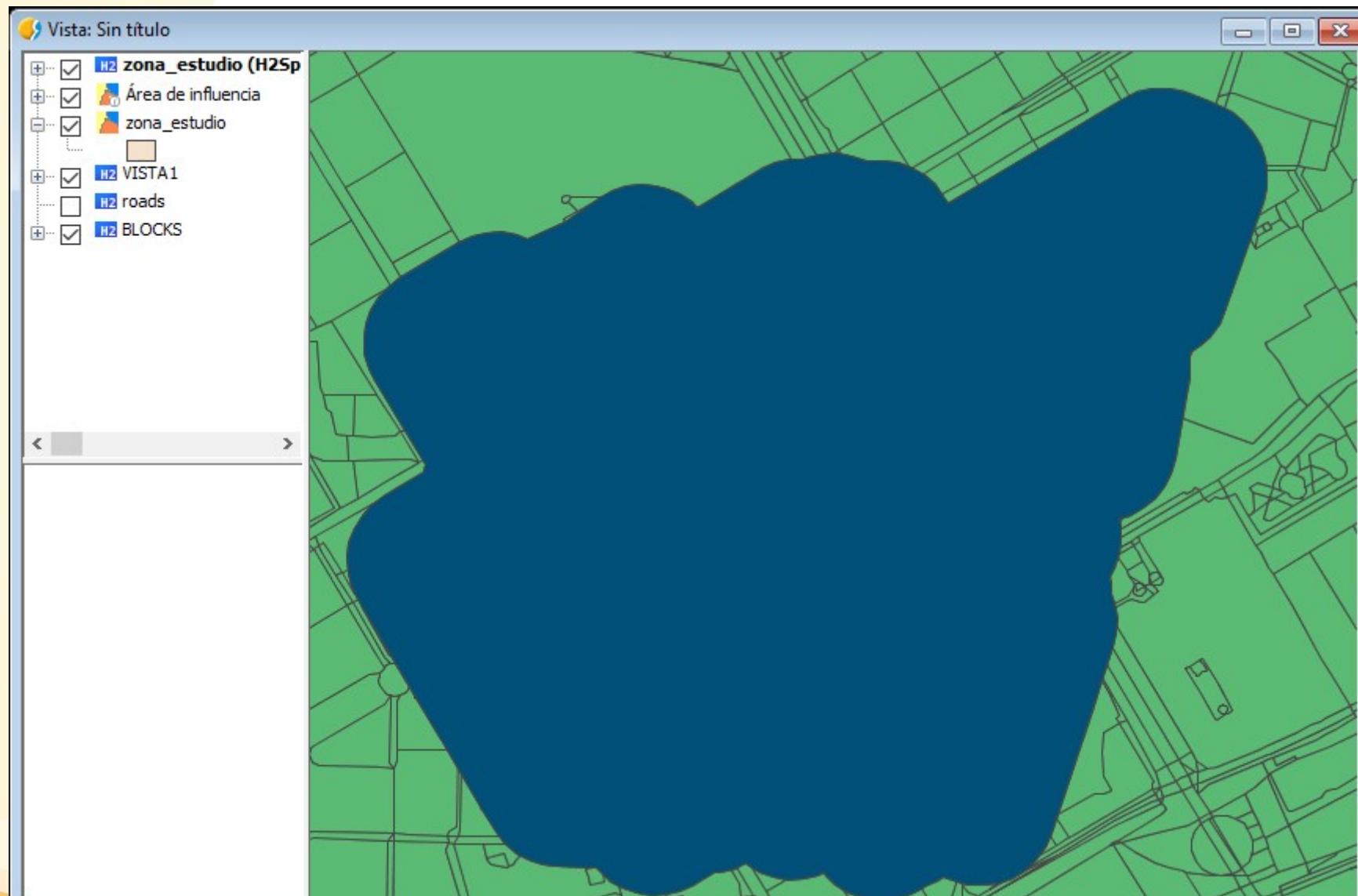
< .0", "0", "true", "true", "0", "0", "#" >



- Exportar datos a la base de datos



- Exportar datos a la base de datos





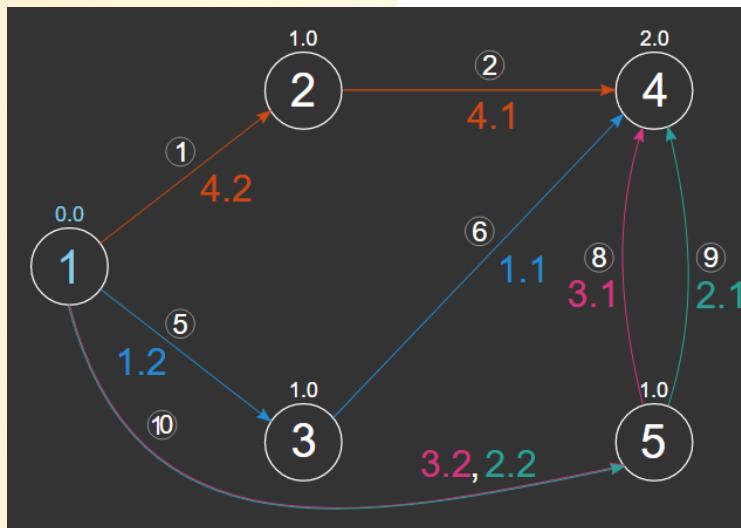
- Inicializar extensión espacial:

```
CREATE ALIAS IF NOT EXISTS H2GIS_EXTENSION FOR
"org.h2gis.ext.H2GISExtension.load";
CALL H2GIS_EXTENSION();
```

<http://www.h2gis.org/>

H2GIS: Casos de estudio

- Redes



<http://www.h2gis.org/>

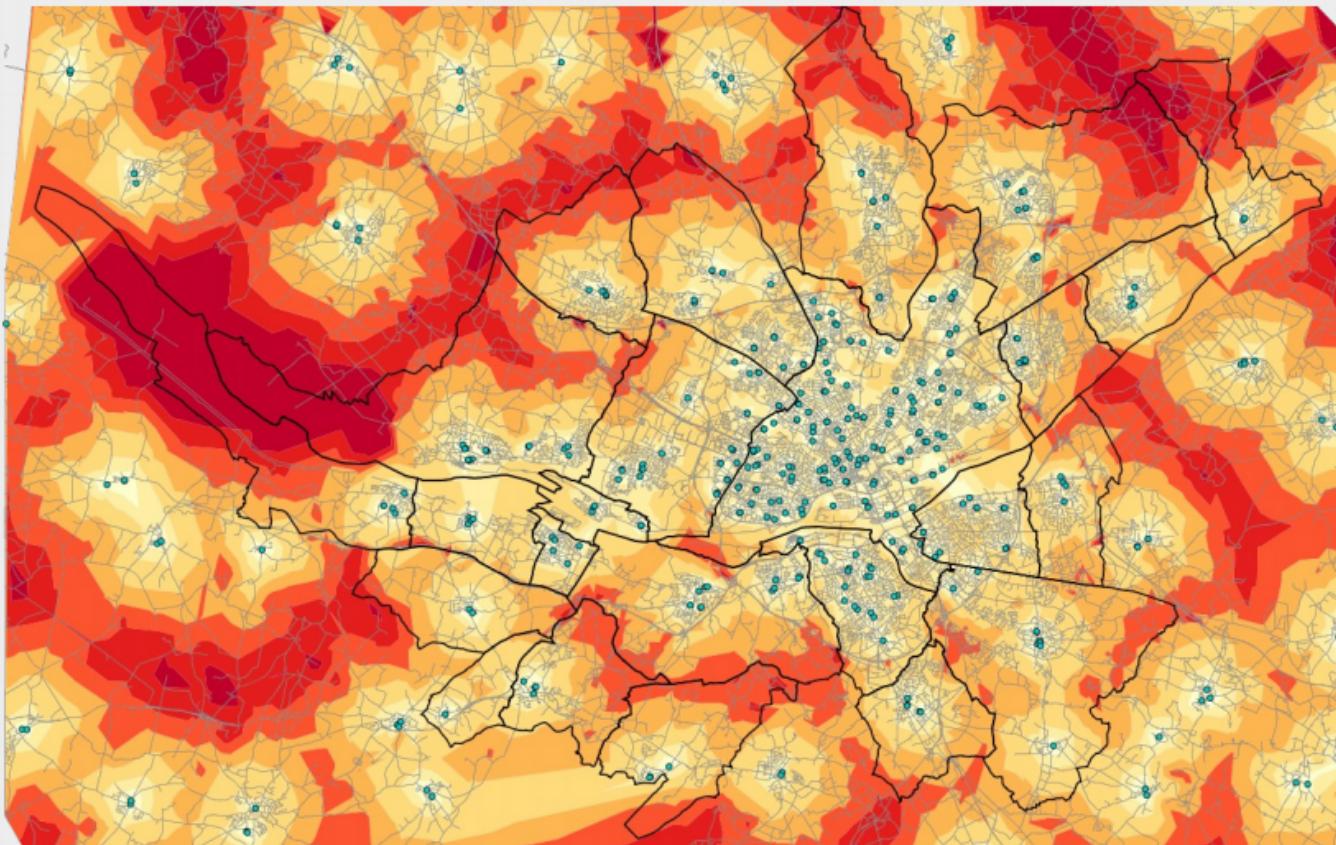
H2GIS: Casos de estudio

- Redes



Scenario comparison

Distance map



<http://www.h2gis.org/>

H2GIS: Casos de estudio

- Cálculo de sombras



H2GIS: Casos de estudio

- Cálculo de sombras

```
SET @PLACE ='POINT(-0.379320 39.466604)';
DROP TABLE IF EXISTS sunposition;
CREATE table sunposition (id int, the_geom geometry);
INSERT INTO sunposition values(1, ST_SunPosition(@PLACE, '2015-01-30
8:00:00+01:00'));

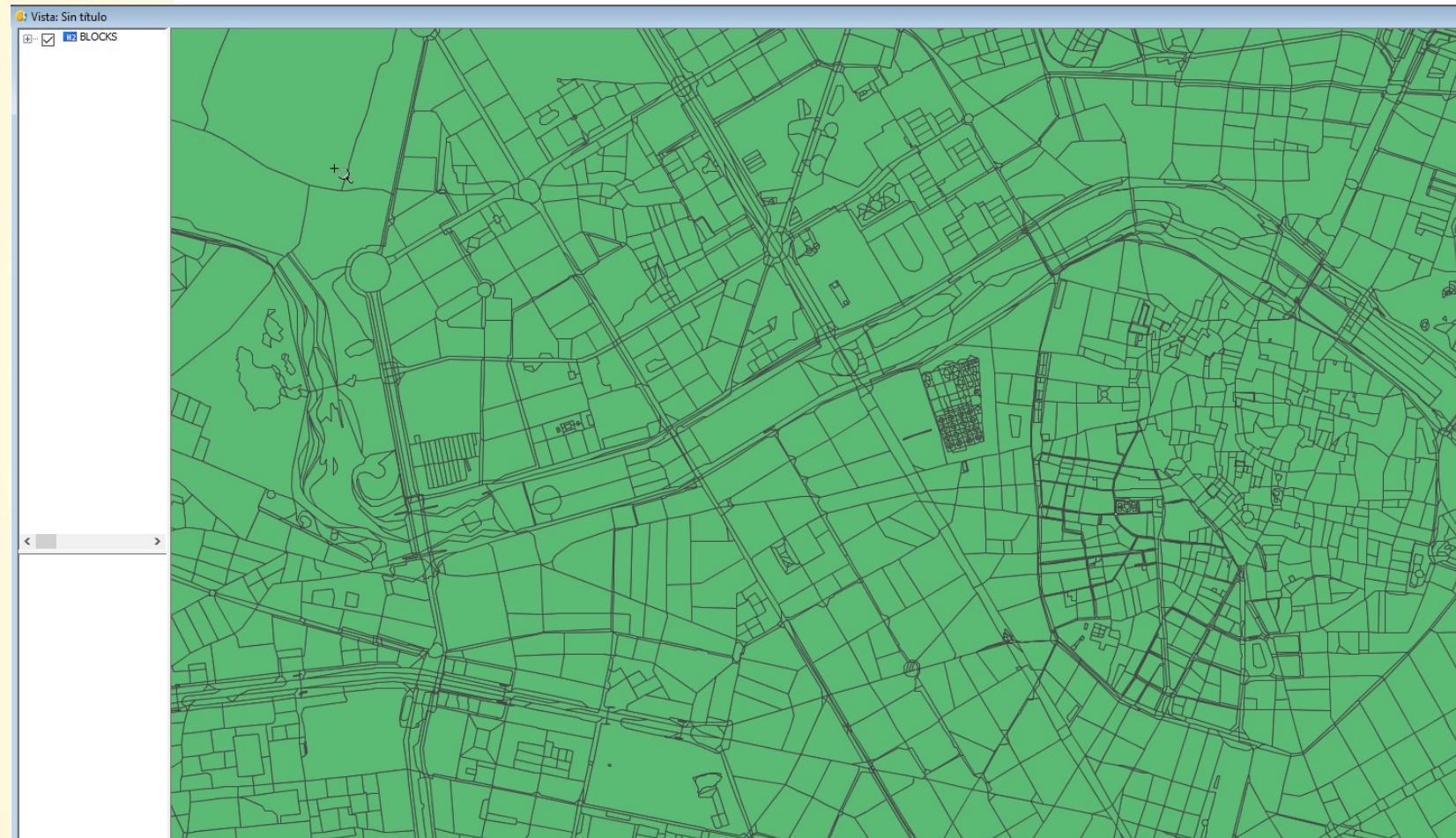
INSERT INTO sunposition values(5, ST_SunPosition(@PLACE, '2015-01-30
12:00:00+01:00'));

DROP TABLE IF EXISTS shadow1, shadow2, shadow3, shadow4, shadow5,
shadow6, shadow7, shadow8, shadow9, shadow10;

CREATE TABLE shadow1 AS SELECT
ST_Geometryshadow(ST_GeometryN(a."geometry" ,1), b.the_geom, 3)
the_geom FROM "buildings" a, SUNPOSITION b WHERE b.id=1;
CREATE TABLE shadow5 AS SELECT
ST_Geometryshadow(ST_GeometryN(a."geometry" ,1), b.the_geom, 3)
the_geom FROM "buildings" a, SUNPOSITION b WHERE b.id=5;
```

H2GIS: Casos de estudio

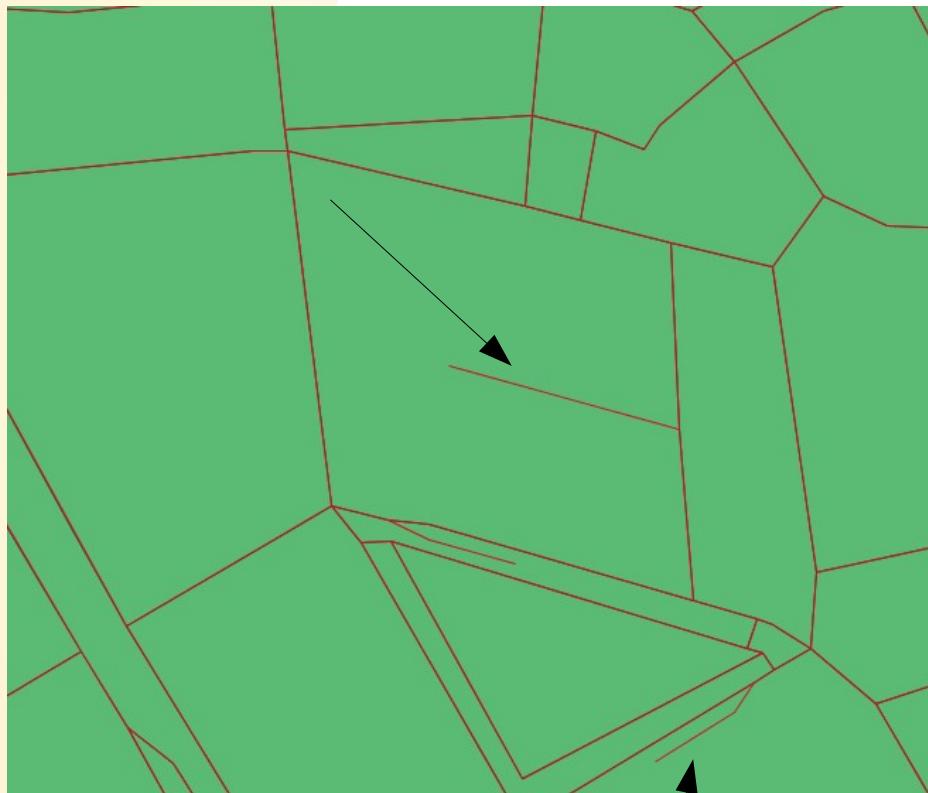
- Extraer bloques de red de carreteras



H2GIS: Casos de estudio

- Extraer bloques de red de carreteras

Roads



Blocks



H2GIS: Casos de estudio

- Extraer bloques de red de carreteras (1)

```
-- Create the grid (cells of 2km). Will be used to clip the roads
```

```
DROP TABLE IF EXISTS grid;
```

```
CREATE TABLE grid AS SELECT * FROM st_makegrid('POLYGON((715000 4363978,  
715000 4379448, 732000 4379448, 732000 4363978, 715000 4363978))'::GEOMETRY,  
500, 500);
```

```
CREATE SPATIAL INDEX ON grid(the_geom);
```

```
-- Create polygon in cells from cutting roads
```

```
DROP TABLE IF EXISTS polygons_cell;
```

```
CREATE TABLE polygons_cell(the_geom geometry, index_i int, index_j int, id  
int)
```

```
AS (SELECT  
ST_Polygonize(ST_Union(ST_CollectionExtract(ST_Intersection(ST_Accum(a."geome  
try"), b.the_geom),2), ST_ExteriorRing(ST_GeometryN(b.the_geom,1)))) as  
the_geom, b.ID_COL, b.ID_ROW, b.ID  
FROM "roads" a, grid b  
WHERE a."geometry" && b.the_geom GROUP BY b.the_geom);  
CREATE INDEX ON polygons_cell(id);  
CREATE INDEX ON grid(id);
```

H2GIS: Casos de estudio

- Extraer bloques de red de carreteras (2)

```
-- Explode multi-polygons cell into simple polygon
DROP TABLE IF EXISTS explode_polygons_cell;
CREATE TABLE explode_polygons_cell(gid serial, THE_GEOM POLYGON, INDEX_I
int,INDEX_J int)
AS (SELECT null, the_geom, index_i, index_j FROM ST_EXPLODE('polygons_cell'))
UNION ALL (SELECT null, a.the_geom,a.ID_COL, a.ID_ROW FROM grid a LEFT JOIN
polygons_cell b ON a.ID = b.ID GROUP BY A.ID, b.ID, a.the_geom HAVING b.ID IS
NULL);
CREATE INDEX ON explode_polygons_cell(index_i,index_j);
CREATE SPATIAL INDEX ON explode_polygons_cell(the_geom);

-- Find polygon with common segment between adjacent cells
DROP TABLE IF EXISTS polygon_edges;
CREATE TABLE polygon_edges (EDGE_ID SERIAL, START_NODE INT, END_NODE INT)
AS SELECT null, A.GID as START_NODE, B.GID as END_NODE
FROM explode_polygons_cell A, explode_polygons_cell B
WHERE (A.GID<B.GID AND A.THE_GEOM && B.THE_GEOM AND (ABS(A.index_i-B.index_i) =
1 OR ABS(A.index_j-B.index_j) = 1) AND ST_DIMENSION(ST_INTERSECTION(A.THE_GEOM,
B.THE_GEOM)) = 1);

DROP TABLE IF EXISTS polygon_edges_EDGE_CC, polygon_edges_NODE_CC;

CALL ST_CONNECTEDCOMPONENTS('polygon_edges', 'undirected');
```

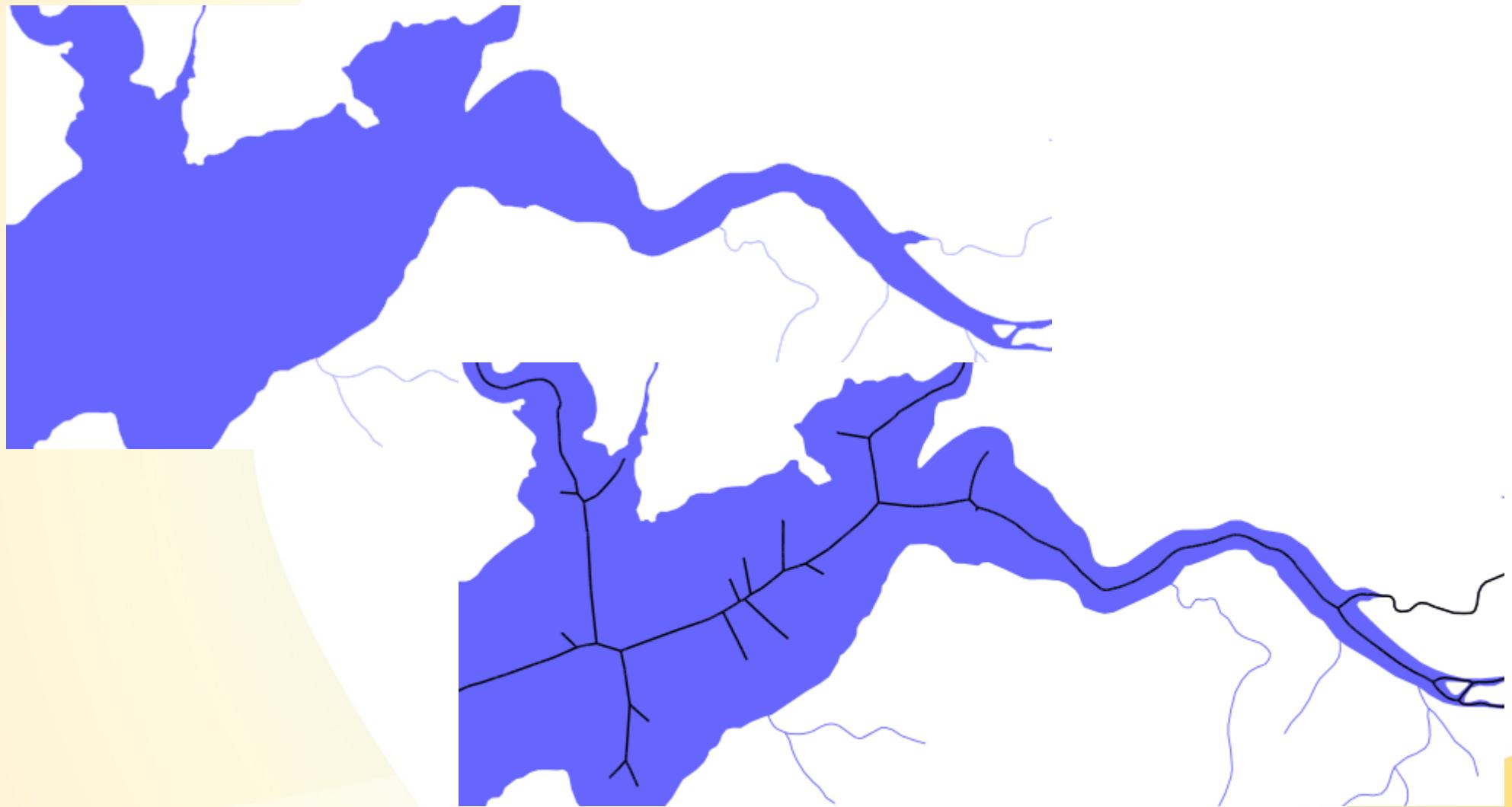
H2GIS: Casos de estudio

- Extraer bloques de red de carreteras (3)

```
-- Unify polygons that share a boundary
DROP TABLE IF EXISTS polygons_cell_union;
CREATE TABLE polygons_cell_union
AS SELECT ST_UNION(ST_ACCUM(A.THE_GEOM)) AS THE_GEOM
FROM explode_polygons_cell A, polygon_edges_NODE_CC B
WHERE A.GID=B.NODE_ID GROUP BY B.CONNECTED_COMPONENT;
```

H2GIS: Casos de estudio

- Esqueleto de polígono



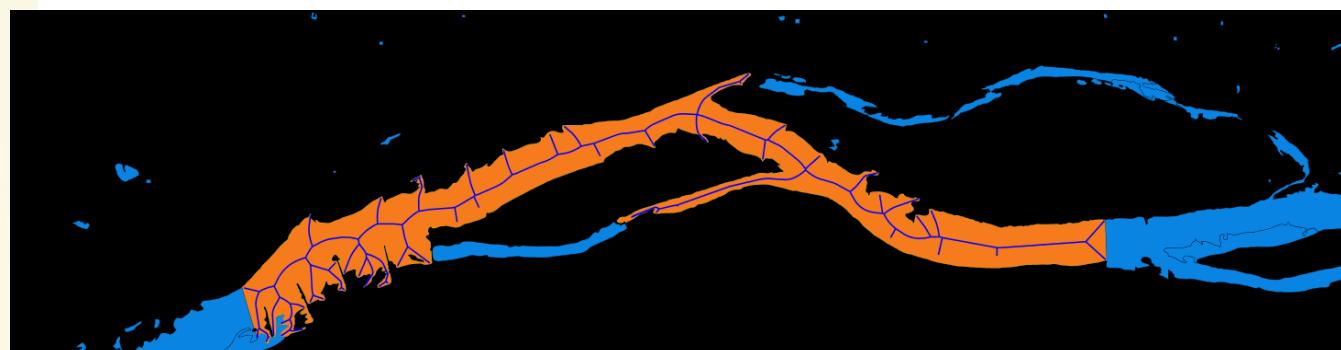
H2GIS: Casos de estudio

- Esqueleto de polígono

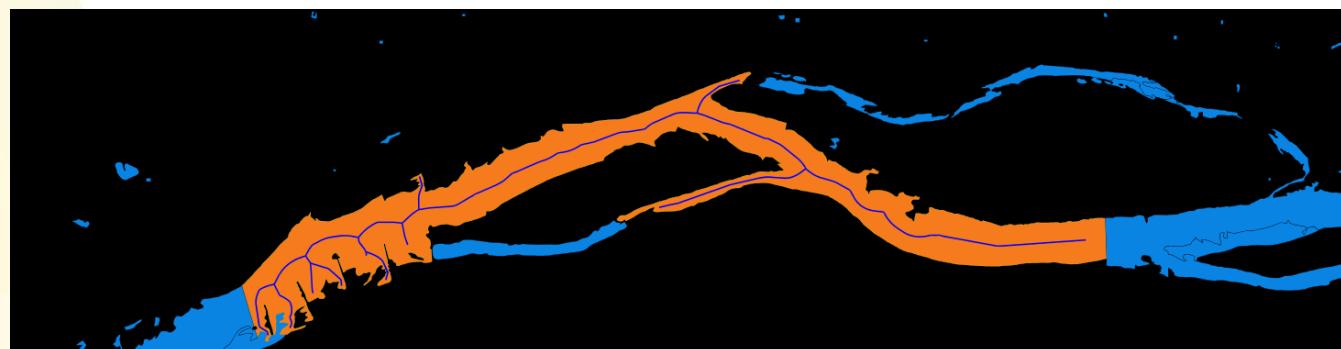
Ratio
Centrality



0.01

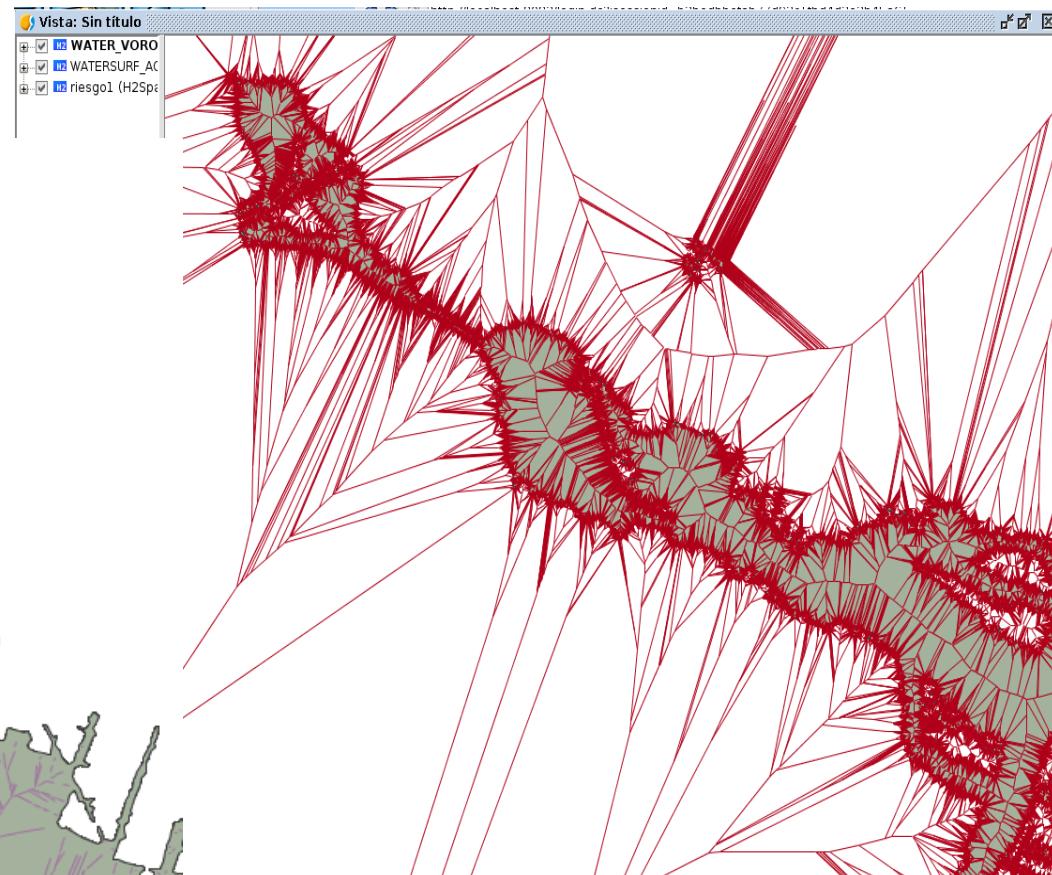


0.1



H2GIS: Casos de estudio

- Esqueleto de polígono



H2GIS: Casos de estudio

- Extraer bloques de red de carreteras (2)

```
-- Add some input variables
-- Epsilon is the merge distance of two close points
set @EPSILON = 1;
-- River width is the minimal river width to take account for
set @MINIMAL_RIVER_WIDTH = 4;
-- Centrality is a network importance coefficient filtering between 0 and 1.
set @RATIO_CENTRALITY = 0.8;

-- Merge adjacent polygons, the simplify them and final densify their contours.
Densification is done in order to create triangles where sides must fit into the width
of the polygons. A theoretical density of 0m will create a valid skeleton of polygons.
drop table if exists watersurf_accum;
create table watersurf_accum as select
ST_SIMPLIFYPRESERVEPOLOGY(ST_BUFFER(ST_UNION(ST_ACCUM("geometry")), 0),@EPSILON)
the_geom from "riesgo";

-- Create voronoi edges
drop table if exists water_voronoi;
create table water_voronoi as select
ST_VORONOI(ST_DELAUNAY(ST_UPDATEZ(ST_REMOVEREPEATEDPOINTS(ST_PRECISIONREDUCER(ST_TOMULTI
POINT(ST_DENSIFY(ST_ACCUM(THE_GEOM),@MINIMAL_RIVER_WIDTH / 2)),@EPSILON)),0)), 1)
the_geom from watersurf_accum;
-- Explode the MultiLineStrings into multiple rows of LineString
drop table if exists water_voronoi_edges;
create table water_voronoi_edges as select * from st_explode('water_voronoi');
```

H2GIS: Casos de estudio

- Extraer bloques de red de carreteras (2)

```
-- Create optimisation structure in order to speedup filtering
SET @EXTENT = SELECT ST_EXTENT(THE_GEOM) THE_GEOM FROM watersurf_accum;
SET @WIDTH = SELECT ST_XMAX(@EXTENT) - ST_XMIN(@EXTENT);
SET @HEIGHT = SELECT ST_YMAX(@EXTENT) - ST_YMIN(@EXTENT);
SET @CELL_SIZE = GREATEST(@WIDTH / 30, @HEIGHT/30);
drop table if exists GRIDED_POLYGON;
create table GRIDED_POLYGON as select ST_INTERSECTION(G.THE_GEOM, P.THE_GEOM) THE_GEOM
FROM WATERSURF_ACCUM P, ST_MAKEGRID(@EXTENT,@CELL_SIZE, @CELL_SIZE) G WHERE
ST_INTERSECTS(G.THE_GEOM, P.THE_GEOM);
create spatial index on GRIDED_POLYGON(THE_GEOM);
-- Keep only the voronoi edges that are inside the polygons
drop table if exists water_skel;
create table water_skel(THE_GEOM GEOMETRY) as select V.THE_GEOM THE_GEOM FROM
water_voronoi_edges V WHERE ST_CONTAINS((SELECT ST_UNION(ST_ACCUM(W.THE_GEOM)) the_geom
FROM GRIDED_POLYGON W WHERE v.the_geom && w.the_geom), v.the_geom);
-- Union and simplify skeleton
drop table if exists water_skel_simple_accum;
create table water_skel_simple_accum as select ST_LINEMERGE(ST_ACCUM(THE_GEOM)) THE_GEOM
FROM water_skel;
drop table if exists water_skel_simple;
create table water_skel_simple(PK SERIAL PRIMARY KEY, THE_GEOM GEOMETRY) as select null,
the_geom from ST_EXPLODE('water_skel_simple_accum');
```

- Más info:
 - <http://www.h2database.com/>
 - <http://www.h2gis.org/>
 - <https://github.com/orbisgis/h2gis/wiki>
 - https://halshs.archives-ouvertes.fr/halshs-01093404/file/H2Network_presentation.pdf
 - http://2016.ogrsc.org/2016_workshops/h2gis/H2GIS_workshop_OGRS2016.pdf
 - <http://www.meteo.fr/icuc9/presentations/GD/GD5-5.pdf>

¡Gracias!

Óscar Martínez

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