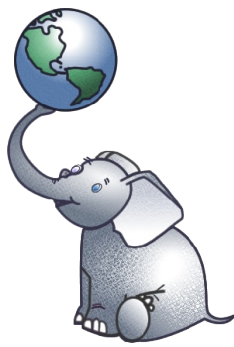



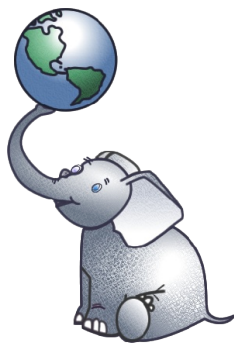
# PostGIS 2





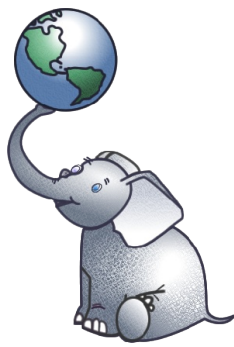
# Astrid Emde

-  WhereGroup , Bonn
- Projektumsetzung im Bereich WebGIS
- Projekte mit PostgreSQL/PostGIS, MapServer, GeoServer, Quantum GIS, Mapbender, OpenLayers
- Aktiv in **OSGeo** und **FOSSGIS e.V.**



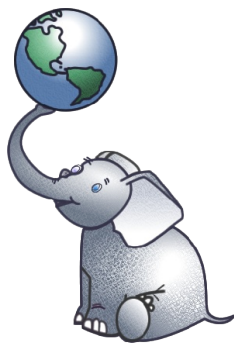
# Übersicht

- PostGIS – das Projekt
- Stand 2.0.x, Ausblick 2.1
- Was bringt die Version 2?



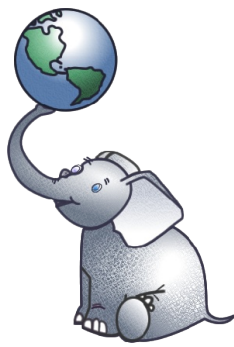
# Workshop

- OSGeo-Live 6.5 mit PostGIS 2.0.1
- Download Daten und Präsentation  
[http://trac.osgeo.org/osgeo/wiki/Live\\_GIS\\_Workshop\\_Install](http://trac.osgeo.org/osgeo/wiki/Live_GIS_Workshop_Install)

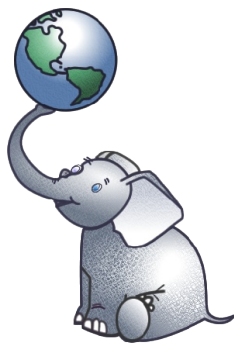


# Workshop Agenda

- Vorstellung der Neuerungen
- Übungen
  - 1. Geometrieverwaltung
  - 2. Neue Funktionen
  - 3. Datenbereinigung
  - 4. Raster



# Was ist PostGIS?



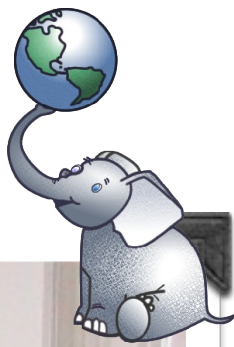
# Was ist PostGIS?

- PostGIS ist ein räumlicher Aufsatz zur Speicherung und Verwaltung von Geodaten in PostgreSQL
- Konform mit der OGC Simple Feature Spezifikation für SQL (SFSQL)
- Orientierung an der ISO Spezifikation SQL/MM Teil 3



# Es war einmal ... 2001

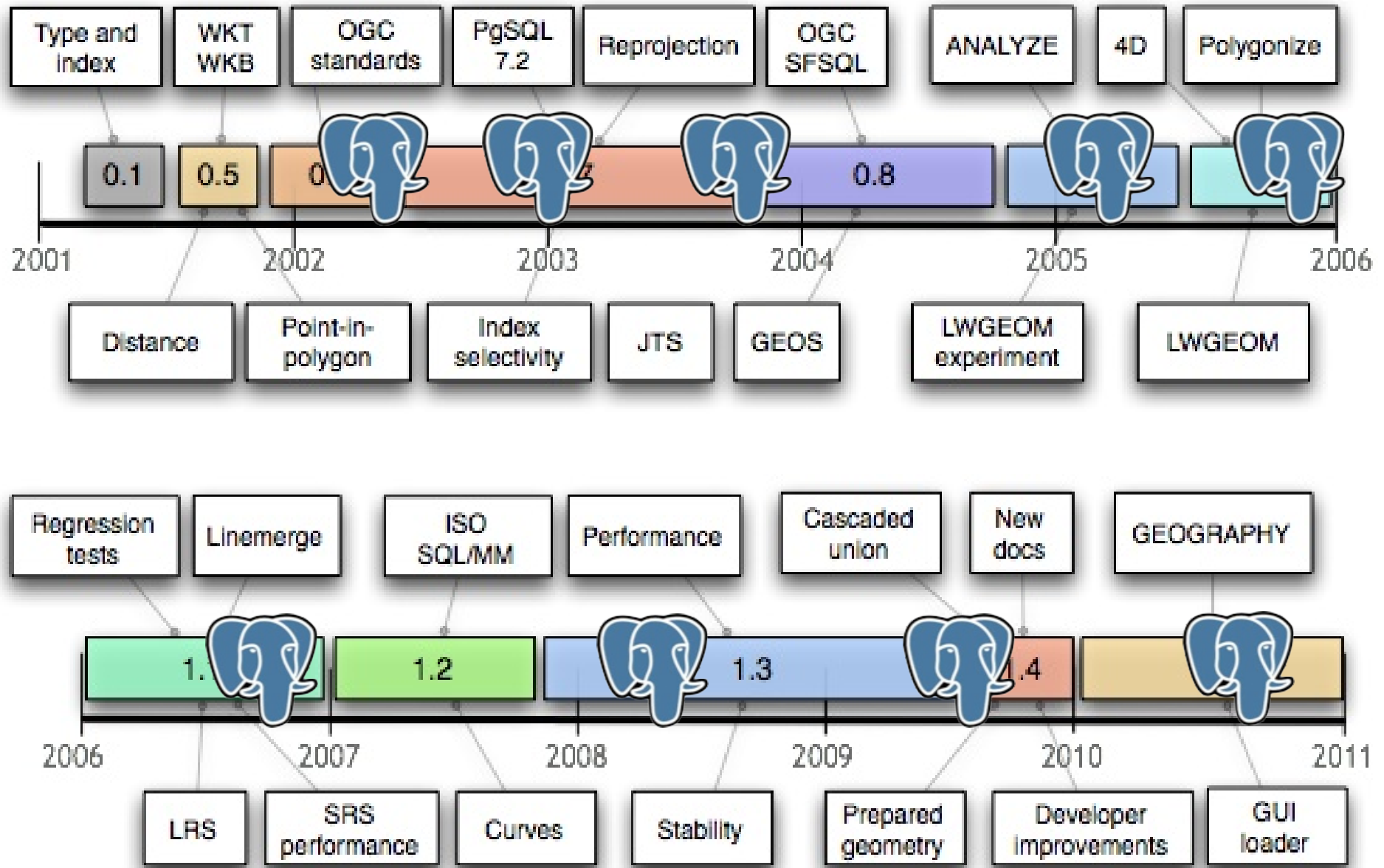


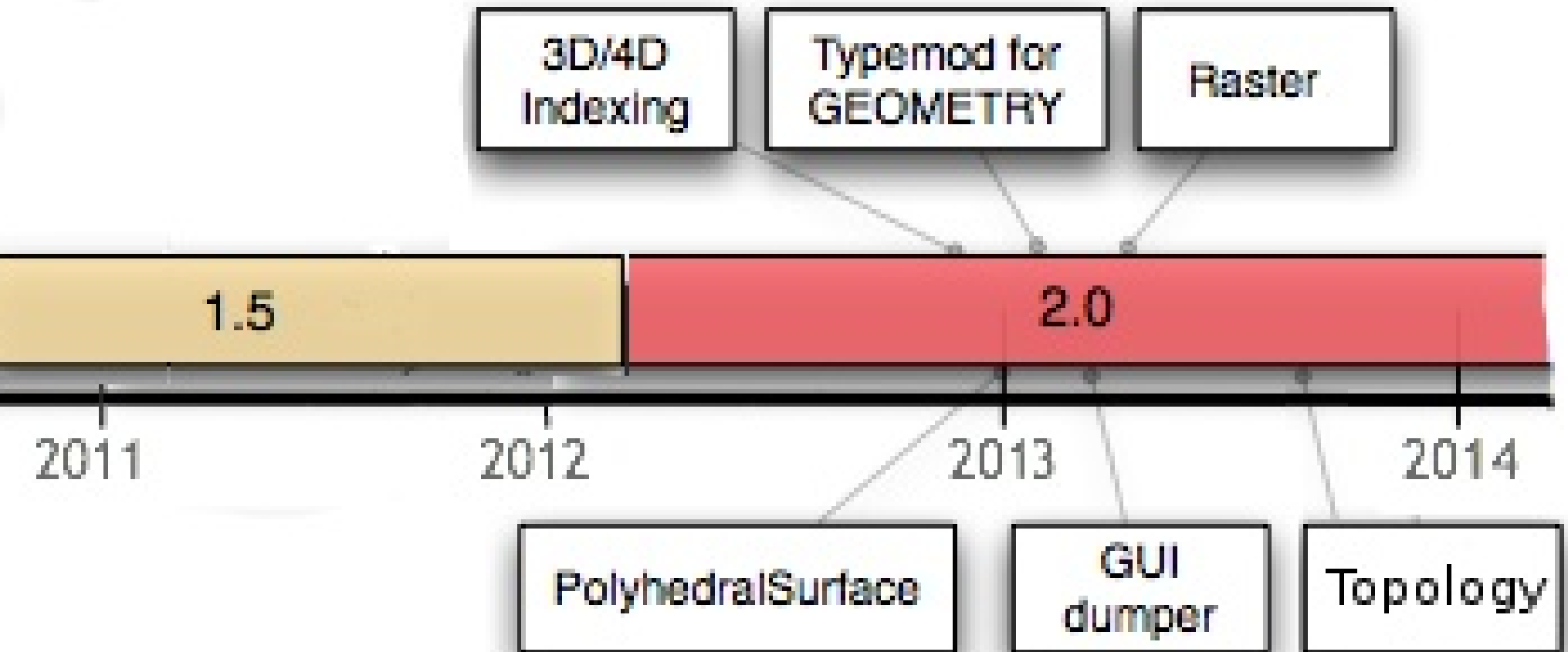
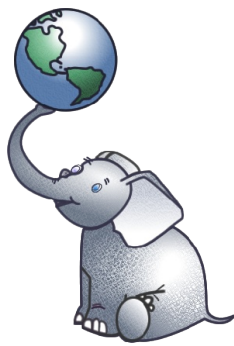


**Dave Blasby**

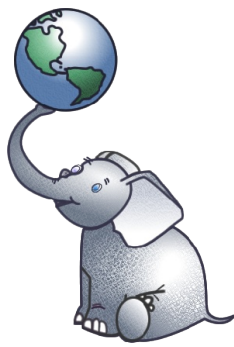
**Paul Ramsey**

[1]





[1]



# PostGIS 2.1

- 30.6.2013 geplant
- beta Release liegt vor
- Läuft mit PostgreSQL 9.3
- 280 Tickets
- z.B. ST\_Resize, ST\_Resample
- LIDAR Punktwolken
- Distanzberechnung kreisförmige Objekte



# PostgreSQL

## PostGIS

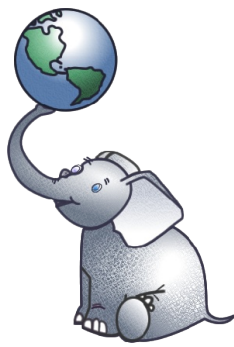
GEOS

PROJ4

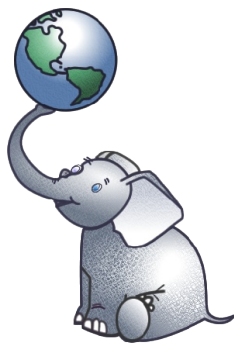
LibXML

GDAL

[1]



# PostGIS 2.0 - Was bringt die Version?



# PostGIS 2.0 Neuerungen

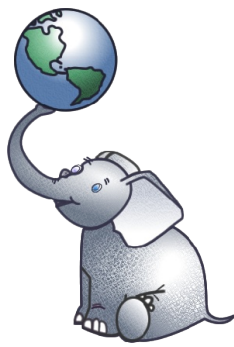
- Vereinfachte Verwaltung
- Erweiterte SQL/MM Unterstützung
- Neue Funktionen
- Rasterunterstützung
- Topology
- Erweiterte 3D Unterstützung

# Was ist beim Umzug zu beachten?



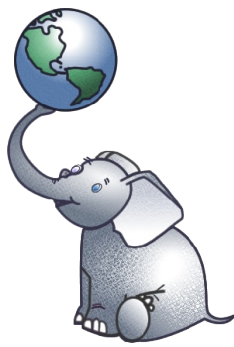
- Hard upgrade ist notwendig
- > 250 Funktionen entfallen





# Hard Upgrade

- Dump/Reload
- Bereinigung mit Hilfe von `postgis_restore.pl`
- Perl-Skript entfernt alle PostGIS Definitionen

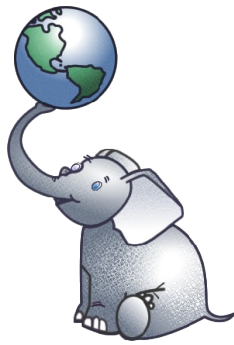


# Hard Upgrade

```
pg_dump -h localhost -p 5432 -U postgres  
-Fc -b -v -f "/data/olddb.backup" olddb
```

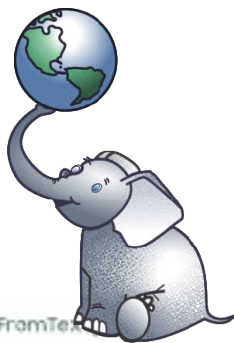
```
createdb -h localhost -p 5432 -U  
postgres -T postgis_template newdb
```

```
perl utils/postgis_restore.pl  
"/data/olddb.backup" | psql -U postgres  
newdb 2> errors.txt
```



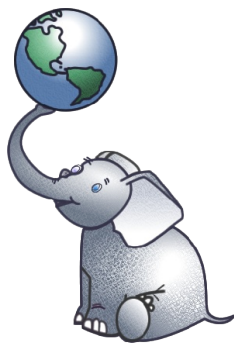
# Funktionen entfallen

- > 250 Funktionen entfallen
- Oft ein neuer Funktionsname gemäß SQL/MM Standard
- Neuer Name ST\_\*
- Neuer Name ST\_3D\*



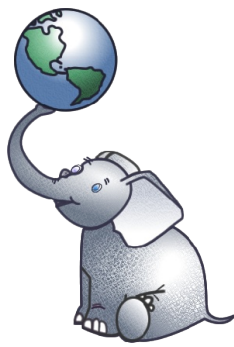
# Entfallende Funktionen

isEmpty(geometry) MPointFromText(text,int4) MultiPolyFromWKB(bytea) PointFromText(text,int4)  
 Force\_3dz(geometry) length3d(geometry) mem\_size(geometry) nPoints(geometry) PointN(geometry,integer) PolygonFromText(text,int4)  
 Force\_3d(geometry) LineFromWKB(bytea) MPointFromText(text) MultiLineStringFromText(text) RotateX(geometry,float8)  
 Force\_2d(geometry) LineMerge(geometry) MakePolygon(geometry) nRings(geometry) PolyFromWKB(bytea,int) st\_box(geometry,float8)  
 distance(geometry,geometry) Expand(geometry,float8) length2d\_spheroid(geometry,spheroid) MPolyFromText(text,int4) PointOnSurface(geometry) st\_box3d(geometry,float8)  
 fix\_geometry\_columns() InteriorRingN(geometry,integer) MultiLineFromWKB(bytea,int) PolygonFromWKB(bytea,int) st\_geometry\_info(geometry)  
 Expand(box3d,float8) Find\_Extent(text,text,text) intersects(geometry,geometry) LineStringFromText(text,int4) relate(geometry,geometry) st\_geometry\_info(geometry)  
 Extent crosses(geometry,geometry) intersection(geometry,geometry) LineFromMultiPoint(geometry) MultiPointFromWKB(bytea,int) SetPoint(geometry,integer,geometry)  
 difference(geometry,geometry) IsSimple(geometry) MakeLine(geometry,geometry) overlaps(geometry,geometry) st\_geometry\_info(box3d) st\_geometry\_info(geometry)  
 Dimension(geometry) Force\_Collection(geometry) hasbbox(geometry) MultiLineStringFromText(text,int4) SE\_Is3D(geometry) SnapToGrid(geometry,geometry,geometry)  
 boundary(geometry) Dump(geometry) GeomFromWKB(bytea) max\_distance(geometry,geometry) relate(geometry,geometry,text) ST\_PolygonFromText(text,int4)  
 hull(geometry) distance\_sphere(geometry,geometry) length(geometry) LineStringFromWKB(bytea,int) PolygonFromWKB(bytea) st\_geometry\_info(geometry)  
 distance\_spheroid(geometry,geometry,spheroid) LineFromText(text,int4) MultiPolyFromWKB(bytea,int) st\_box3d(box2d) st\_geometry\_info(geometry)  
 Centroid(geometry) GeomCollFromWKB(bytea,int) makeLine MPolyFromWKB(bytea,int) SE\_M(geometry) SnapToGrid(geometry,float8)  
 st\_box3d\_in(cstring) st\_box2d(geometry) SE\_EnvelopesIntersect(geometry,geometry) Scale(geometry,float8,float8,float8)  
 combine\_bbox(box2d,geometry) locate\_between\_measures(geometry,float8,float8) SE\_EnvelopesIntersect(geometry,geometry) Scale(geometry,float8,float8,float8)  
**deprecated functions in PostGIS 2.0**  
 GeometryFromText(text) memcollect MultiPointFromWKB(bytea) PointFromWKB(bytea,int) ST\_RemovePoint(geometry,integer)  
 MemGeomUnion line\_locate\_point(geometry,geometry) RemovePoint(geometry,integer) SE\_LocateAlong(geometry,float8) st\_geometry\_info(geometry)  
 Extent3d ForceRRH(geometry) locate\_along\_measure(geometry,float8) PolyFromText(text,int4) st\_geometry\_info(geometry)  
 fine(geometry,float8,float8,float8,float8,float8,float8,float8,float8,float8,float8,float8,float8,float8,float8,float8) SE\_LocateAlong(geometry,float8) st\_geometry\_info(geometry)  
 dPoint(geometry,geometry,integer) ForceRRH(geometry) locate\_along\_measure(geometry,float8) PolyFromText(text,int4) st\_geometry\_info(geometry)  
 ASEWKB(geometry) IsRing(geometry) GeometryFromText(text,int4) multi(geometry) NumPoints(geometry) SE\_Z(geometry) st\_geometry\_info(geometry)  
 buffer(geometry,float8,integer) M(geometry) MakeBox3d(geometry,geometry) MultiPolygonFromText(text) st\_box(geometry,float8)  
 Area(geometry) ExteriorRing(geometry) line\_interpolate\_point(geometry,float8) point\_inside\_circle(geometry,float8,float8,float8) st\_geometry\_info(geometry)  
 AskML(geometry,int4) DumpRings(geometry) length\_spheroid(geometry,spheroid) perimeter3d(geometry) st\_geometry\_info(geometry)  
 AsSVG(geometry,int4) Envelope(geometry) getsrid(geometry) MLineFromText(text,int4) noop(geometry) SE\_LocateBetween(geometry,geometry,geometry)  
 ML(int4,geometry,int4) combine\_bbox(box3d,geometry) IsValid(geometry) MPointFromWKB(bytea,int) probe\_geometry\_columns() st\_geometry\_info(geometry)  
 BdMPolyFromText(text,integer) LineFromText(text) length3d\_spheroid(geometry,spheroid) MultiPointFromText(text) PolyFromText(text) st\_geometry\_info(geometry)  
 BuildArea(geometry) Contains(geometry,geometry) IsClosed(geometry) MakePolygon(geometry,geometry) MultiPolygonFromText(text,int4) SnapToGrid(geometry,geometry,geometry)  
 dPoint(geometry) collect(geometry,geometry) GeomUnion(geometry,geometry) MakePoint(float8,float8, MultiPointFromText(text,int4) SE\_IsMeasured(geometry,geometry)  
 buffer(geometry,float8) MakeBox2d(geometry,geometry) MultiLineFromWKB(bytea,int) RotateY(geometry,float8) st\_geometry\_info(geometry)  
 dropbbox(geometry) GeometryN(geometry,integer) line\_substring(geometry,float8) PolygonFromText(text,int4) Simplify(geometry,geometry)  
 Force\_3dm(geometry) GeomCollFromText(text,int4) makeLine\_garray(geometry[]) NumInteriorRing(geometry) RotateZ(geometry,float8) st\_geometry\_info(geometry)  
 Expand(box2d,float8) GeomCollFromWKB(bytea) getbbox(geometry) MLineFromWKB(bytea,int) PointFromText(text) rename\_geometry\_table\_constraints() st\_geometry\_info(geometry)  
 Force\_4d(geometry) GeomFromWKB(bytea,int) MakePoint(float8,float8, MultiLineFromWKB(bytea) Rotate(geometry,float8) st\_geometry\_info(geometry)  
 Find\_Extent(text,text) GeomCollFromText(text) LineFromWKB(bytea,int) MultiPointFromText(text) perimeter2d(geometry) Polygonize\_garray(geometry[]) st\_geometry\_info(geometry)  
 length2d(geometry) LineStringFromWKB(bytea) LineStringFromText(text) MLineFromWKB(bytea) PolyFromWKB(bytea) reverse(geometry) st\_geometry\_info(geometry)  
 MakePoint(float8,float8) MPolyFromText(text) NumInteriorRings(geometry) SnapToGrid(geometry,float8) st\_geometry\_info(geometry)  
 MPointFromWKB(bytea) MPolyFromWKB(bytea) NumGeometries(geometry) st\_geometry\_info(geometry)

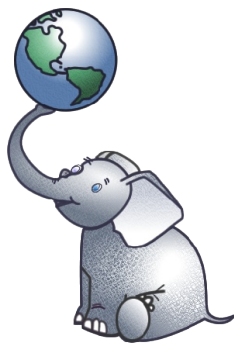


# Achtung Anpassungen!

- Views
- Eigene Funktionen, Trigger, Skripte
- DATA-Angabe MapServer Mapdatei
- Anwendungen wie MapServer, GeoServer, QGIS → Umstieg auf die neueste Version



# legacy.sql



# CREATE EXTENSION

- Installation von PostGIS als Erweiterung
- Ab PostgreSQL 9.1
- Mehr Flexibilität, leichter Upgrade
- PostGIS nicht mehr im Backup

```
CREATE EXTENSION postgis;
```

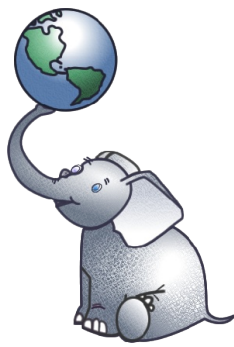
```
CREATE EXTENSION postgis_topology;
```



# Geometrieverwaltung

- Geometriespalten können über Type Modifier erzeugt werden
- `geometry_columns` ist nun ein View, der aus dem Systemkatalog liest

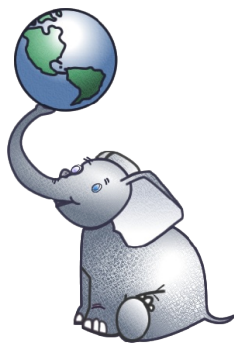




# Geometriespalten über typmod

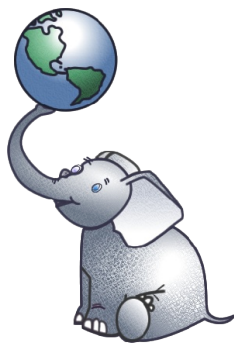
```
CREATE TABLE poi (  
  gid serial,  
  name varchar  
  the_geom geometry (POINT, 25832)  
);
```

# AddGeometryColumn use\_typmod



- use\_typmod – default true, Erzeugung über Type Modifier
- use\_typmod false – legt Geometry über den alten Weg mit Constraints an

```
SELECT AddGeometryColumn
('public',
 'poi',
 'the_geom',
 25832,
 'POINT',
 2,
 true);
```



# Registrierung von Views

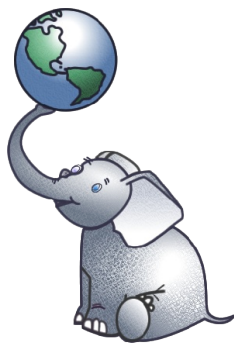
```
CREATE VIEW v_buffer_poi AS
SELECT gid,
name,
ST_Buffer(the_geom, 1) :: geo
metry(Polygon, 25832)
as the_geom
FROM poi;
```



# geometry\_columns

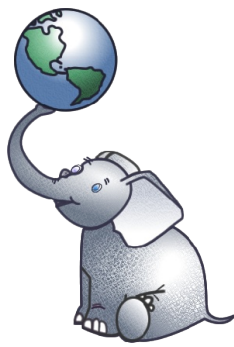
```
SELECT f_table_schema,
f_table_name, f_geometry_column,
coord_dimension,
srid, type
FROM geometry_columns;
```

f_table_schema	f_table_name	f_geometry_column	coord_dimension	srid	type
public	poi	the_geom	2	25832	POINT
public	v_buffer_poi	the_geom	2	25832	POLYGON
public	v_buffer_poi_ohne_typmod	the_geom	2	0	GEOMETRY



# Neue Funktionen

- ST\_FlipCoordinates
- ST\_Split
- ST\_Snap
- ST\_AsRaster
- Verbesserte SQL/MM Unterstützung



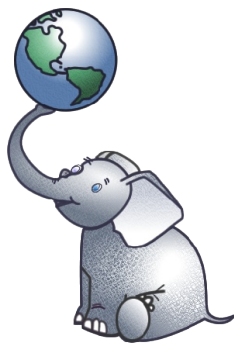
# ST\_FlipCoordinates

```
SELECT ST_AsText(  
  ST_FlipCoordinates(  
    ST_GeomFromText('POINT(10 50)', 4326)  
  )  
);
```

st\_astext

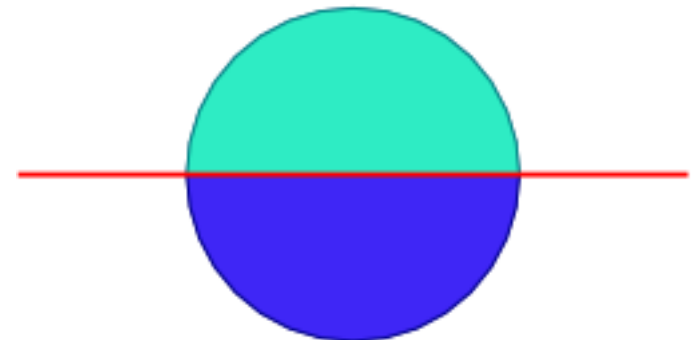
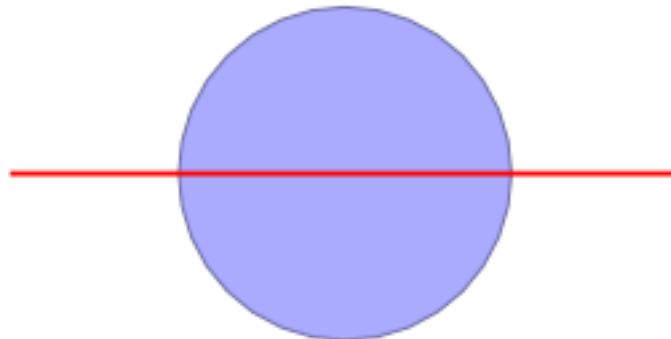
-----

POINT(50 10)



# ST\_Split

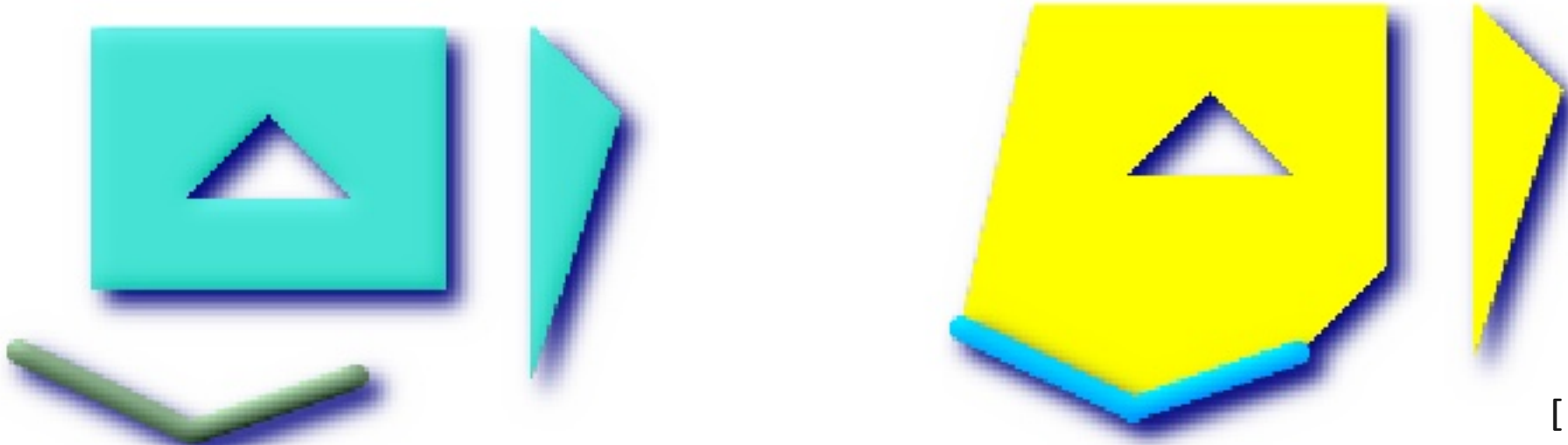
```
SELECT (split).path[1],  
(split).geom::geometry(Polygon,4326) AS  
the_geom FROM (SELECT ST_Dump(ST_Split(  
ST_Buffer(ST_GeomFromText('POINT(10  
50)',4326), 5),  
ST_GeomFromText('LINESTRING(0 50,20  
50)',4326))) AS split) AS foo;
```





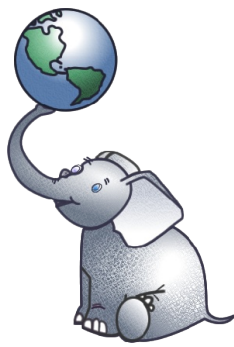
# ST\_Snap

```
SELECT ST_AsText(ST_Snap(poly,line,
ST_Distance(poly,line)*1.25)) AS polysnapped FROM (SELECT
ST_GeomFromText('MULTIPOLYGON(
((26 125, 26 200, 126 200, 126 125,26 125 ),( 51 150, 101
150, 76 175, 51 150 )),(( 151 100, 151 200, 176 175, 151
100 )))') As poly,ST_GeomFromText('LINESTRING (5 107, 54
84, 101 100)') As line) As foo;
```



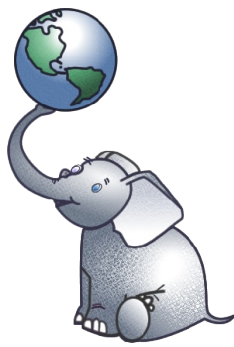
[ 4 ]





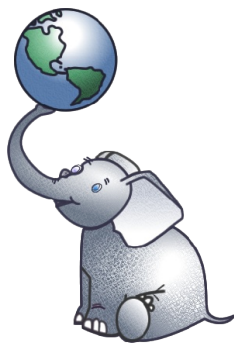
# Hilfe bei der Datenbereinigung

- ST\_IsValidDetail
- ab 1.5 ST\_IsValidReason
- ST\_MakeValid
- ST\_RemoveRepeatedPoints



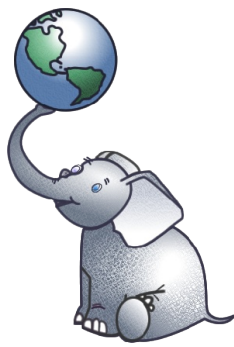
# Invalide Polygone





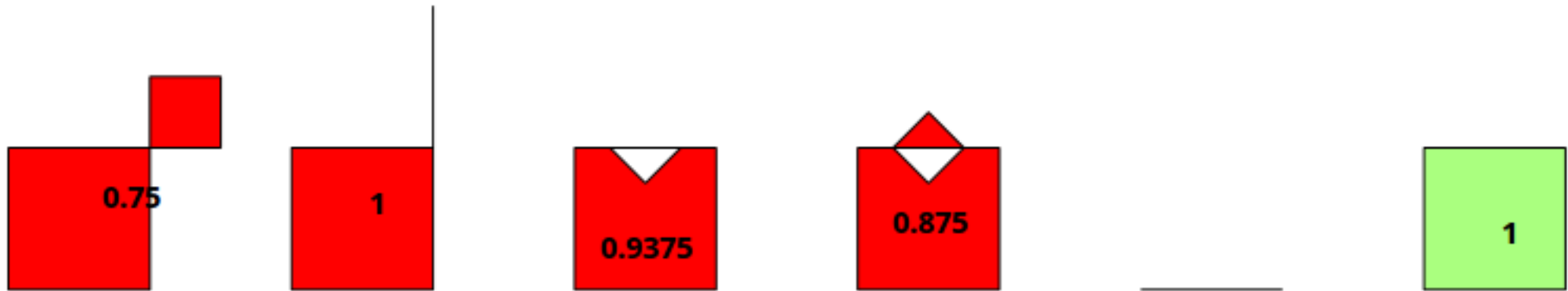
# ST\_IsValidDetail

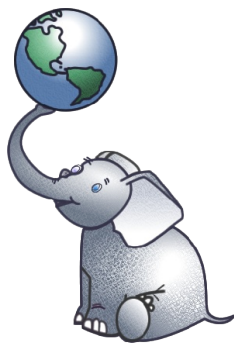
```
SELECT
ST_IsValidReason(the_geom) as reason,
ST_IsValidDetail(the_geom) as detail,
ST_Area(the_geom) as area
FROM invalid_polygons
WHERE
ST_IsValid(the_geom) = false;
```



# ST\_IsValidDetail

reason	detail	area
Self-intersection[1 1] 0000F03F)	(f,Self-intersection,010100000000000000000000F03F00000000	0.75
Self-intersection[3 1] 0000F03F)	(f,Self-intersection,010100000000000000000000084000000000	1
Self-intersection[4.25 1] 0000F03F)	(f,Self-intersection,01010000000000000000000001140000000000	0.9375
Self-intersection[6.25 1] 0000F03F)	(f,Self-intersection,01010000000000000000000001940000000000	0.875
Too few points in geometry component[8 0]	(f,"Too few points in geometry component",010100000000000000000000020400000000000000000)	0
Valid Geometry (6 Zeilen)	(t,,)	1





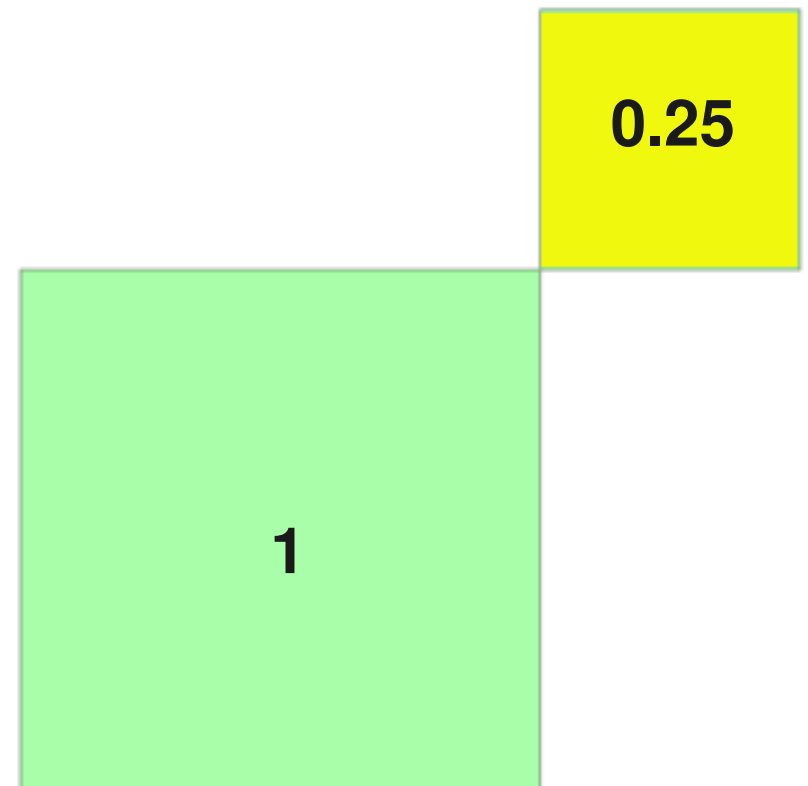
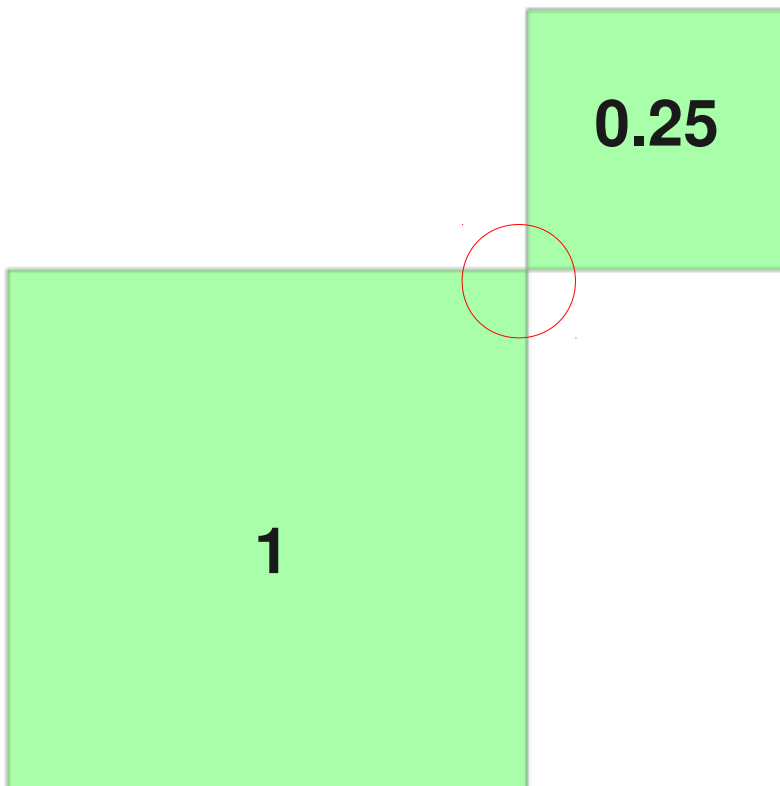
# Self-intersection

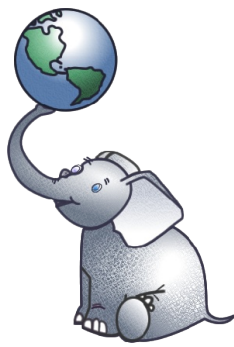
POLYGON

Fläche 0.75 **falsch!**

MULTIPOLYGON

Fläche 1.25





## ST\_MakeValid

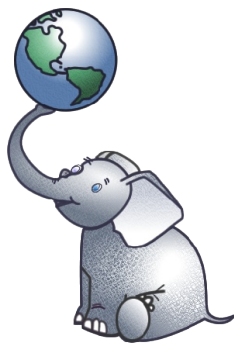
Update invalid\_polygons

set the\_geom =

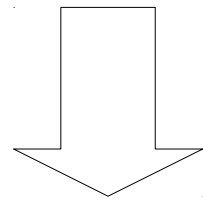
ST\_MakeValid(the\_geom)

WHERE

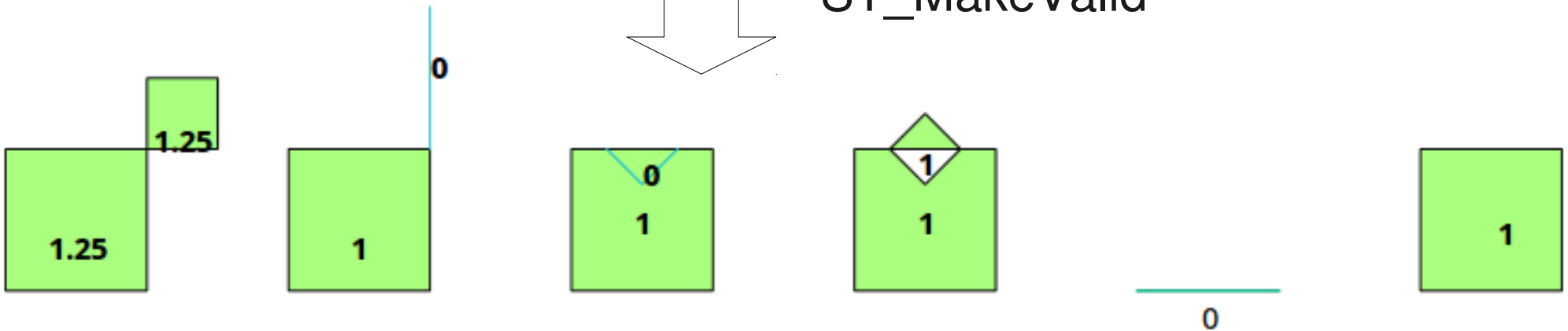
ST\_IsValid(the\_geom)=false;



# Valide Polygone



ST\_MakeValid





# ST\_RemoveRepeatedPoints

```
SELECT ST_AsText(the_geom) old,  
ST_AsText(ST_RemoveRepeatedPoints(the_geom))  
as new  
from invalid_polygons where gid=6;
```

old

-----

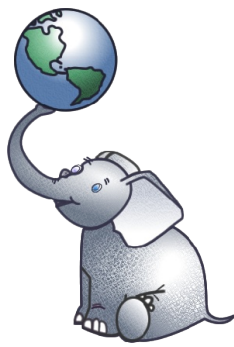
```
POLYGON((10 0,10 1,11 1,11 1,11 0,10 0))
```

new

-----

```
POLYGON((10 0,10 1,11 1,11 0,10 0))
```

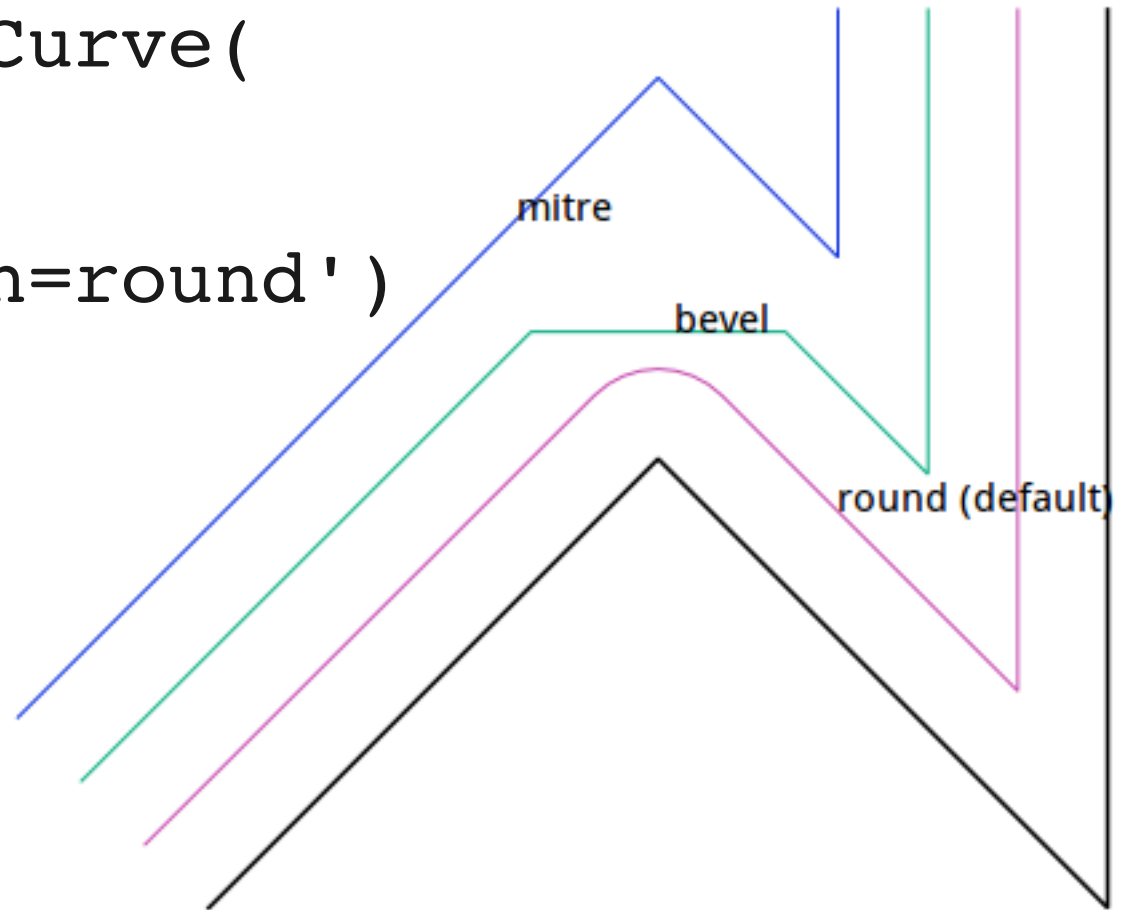




# ST\_OffsetCurve

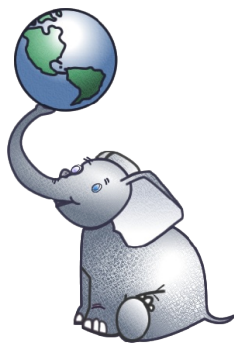
- Erzeugt eine parallele Linie

```
SELECT ST_OffsetCurve(
the_geom, 2,
'quad_segs=4 join=round')
FROM lines;
```

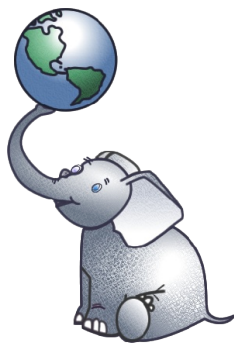


Neu!

# Rasterunterstützung

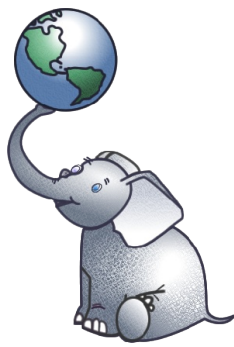


- Raster Import / Export über GDAL
- > 70 Funktionen z.B. Verschneidung, Ausgabe von Pixelwerten, Statistiken, Generierung, Prozessierung
- Vektor <- -> Raster
- Raster Analyse
- Unterstützung durch GDAL 1.8+, MapServer, QGIS Plugin, GeoServer, gvSIG ...



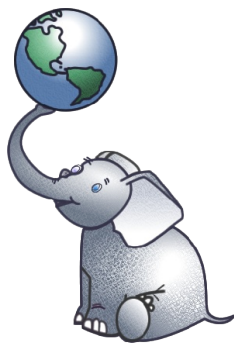
# raster2pgsql

```
raster2pgsql -s 4326 -I -C  
-M -F  
-l 4  
-t 100x100  
/user/germany/germany.tif  
germanyt | psql -U user -p  
5433 -d fossgis
```



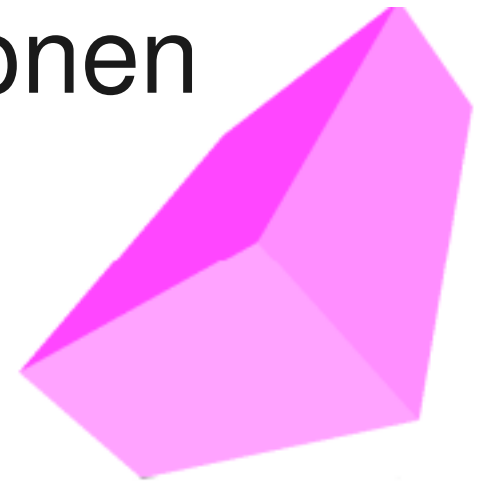
# Raster

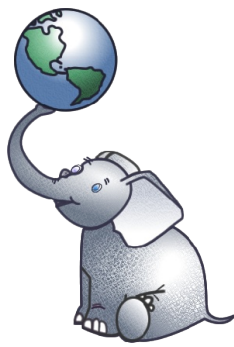
- `ST_AsPNG,`  
`ST_AsJPEG, ST_AsGDALRaster, ...`
- `ST_AsRaster`
- `ST_Intersects(raster, geometry)`
- `ST_PixelHeight(raster)`
- `ST_NumBands(raster)`
- `ST_Resample`
- `ST_Polygon`
- `gdal_translate`



# 3D

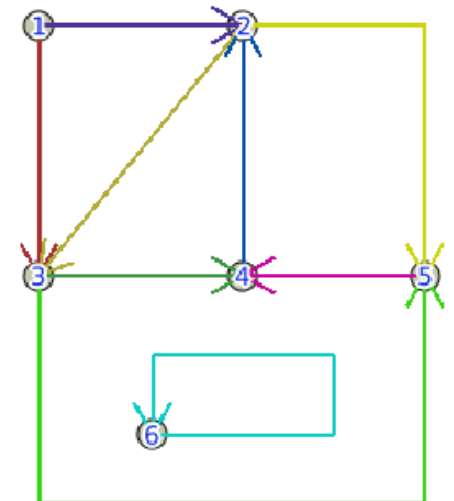
- Neue Geometrietypen
  - TRIANGLE, TIN,  
POLYHEDRALSURFACE
- Neue und erweiterte Funktionen
- 3D/4D Index

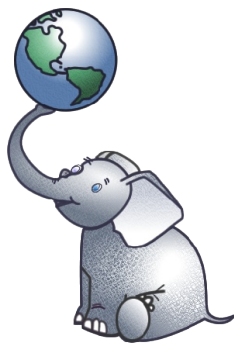




# Topology

- Volle SQL/MM Topology Unterstützung
- Neuer Datentyp TopoGeometry
- Schema topology mit > 50 Funktionen
- Umwandlung in geometry über TypeCast (topo::geometry)
- Siehe [PostGIS Wiki Topology](#)





# GiST KNN Suche (9.1)

- K-Nearest Neighbour Index

Beispiel: Ausgabe der 10 nächsten Objekte zu einem Punkt

```
SELECT name, gid
FROM geonames
ORDER BY geom <-> st_setsrid(st_makepoint(-
90,40),4326)
LIMIT 10;
```

<-> Distance Centroid BBOX

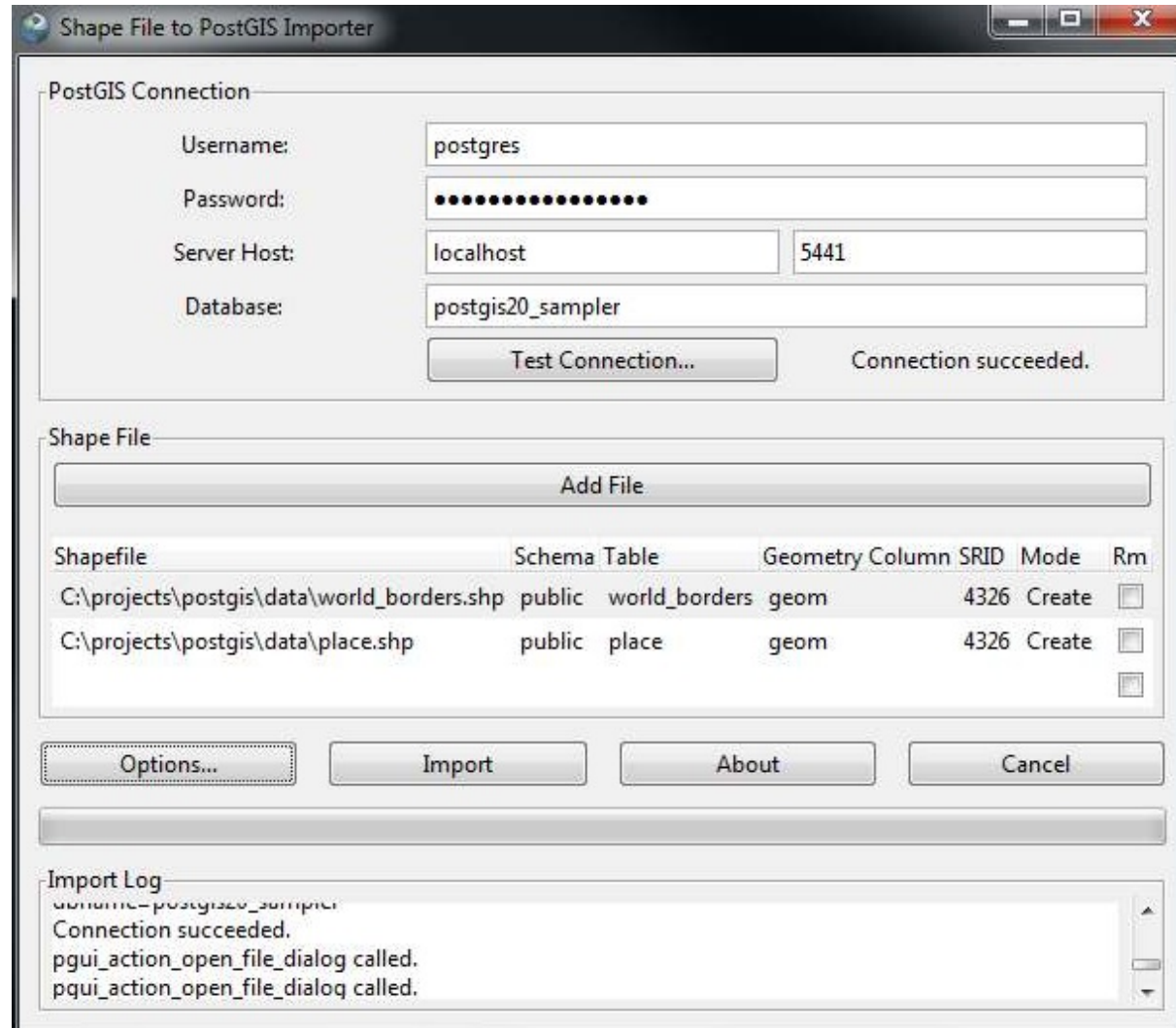
<#> Distance BBOX

mehr unter: [GiST KNN Suche](#)



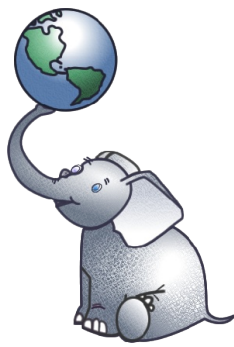
# shp2pgsql-GUI

- Plugin in pgAdmin3
- Import mehrerer Shapes



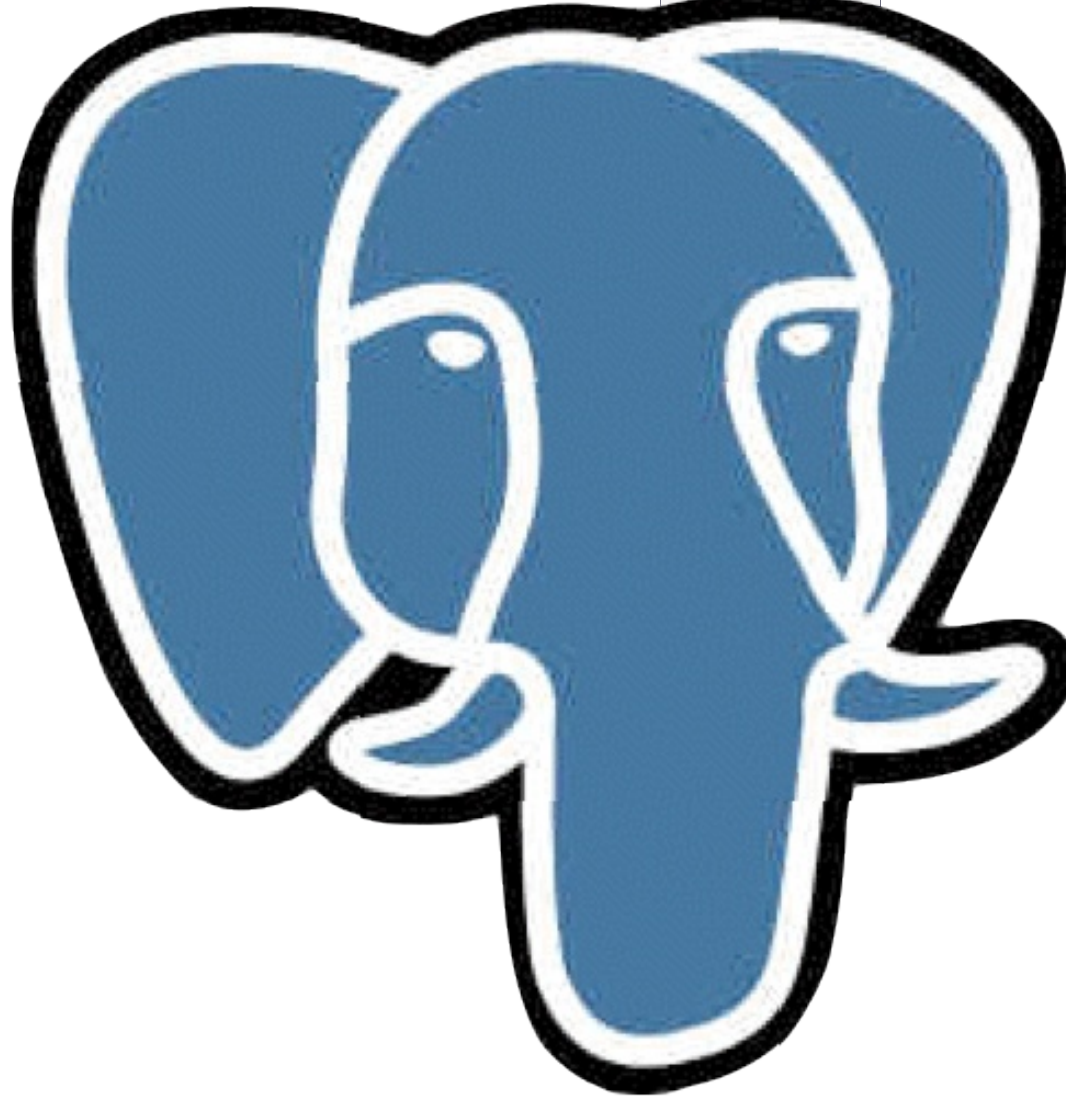
[3]





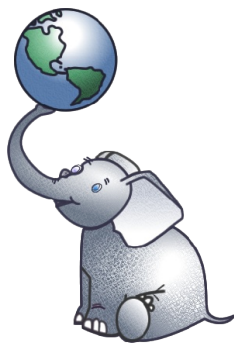
# PostGIS 2.0

- .... und vieles mehr
- **Release Notes 2.0.0**
- PostGIS Dokumentation: PostGIS Functions new, behavior changed, or enhanced in **2.0**



Vielen Dank!

[1]

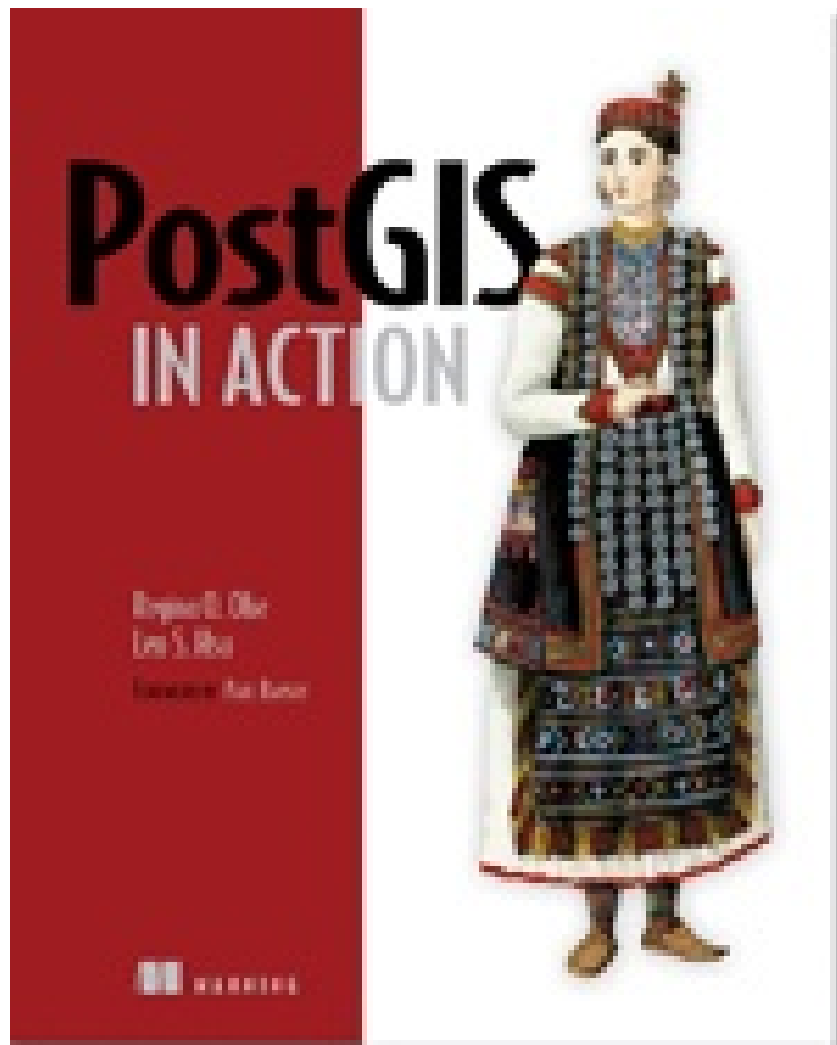


# PostGIS Dokumentation

- Sehr gute und ausführliche Dokumentation mit SQL-Beispielen und Grafiken
- HTML oder PDF-Version
- <http://postgis.org/documentation/>
- **PostGIS Wiki** (Tutorials, Präsentationen, Videos)



# PostGIS in Action



<http://www.manning.com/obe/>

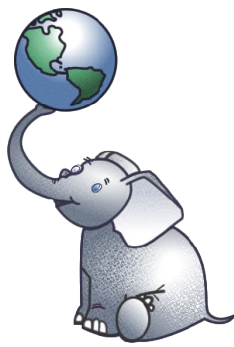
Regina O. Obe und Leo S. Hsu

April 2011, 520 Seiten

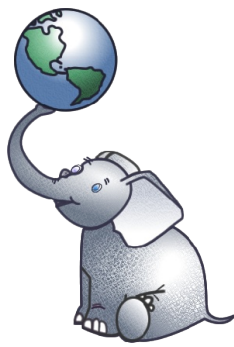
ISBN 9781935182269

2. Auflage mit  
PostGIS 2.1  
In Arbeit

# PostGIS auf



- <http://live.osgeo.org>
- **PostGIS 2.0 auf OSGeo-Live 6.5**
- GIS Software Kollektion
- 50 Open Source GIS Anwendungen
- Beispieldaten
- Dokumentationen
- Basiert auf Xubuntu 12.4.
- Bootfähige DVD, USB-Stick oder virtuelle Maschine
- ISO zum Download unter <http://live.osgeo.org/de/download.html>



# Konferenzen

- FOSS4G 2013, Nottingham
- FOSS4G-CEE 2013, Bukarest
- PG.Conf, SoTM, AGIT, INTERGEO, LinuxTag ...

# Quellen



- [1] Paul Ramsey  
PostGIS Knows Where You Are (PGCon 2011, Ottawa)
- [2] Paul Ramsey  
The State of PostGIS (FOSS4G 2011)
- [3] Regina Obe und Leo Hsu  
PostGIS 2.0 the new stuff (FOSS4G 2011, Denver)
- [4] PostGIS Documentation <http://postgis.org>
- Weitere Präsentationen und Videos im PostGIS Wiki  
<http://trac.osgeo.org/postgis/wiki/UsersWikiMain>



# Vielen Dank !

## Fragen?

Astrid Emde  
WhereGroup, Bonn  
[astrid.emde@wherereggroup.com](mailto:astrid.emde@wherereggroup.com)