



Evolution of Regional Jet Operating Patterns in the Continental US

MIT International Center for Air
Transportation

Aleksandra Mozdzanowska,
R. John Hansman

Example Regional Jets

ERJ 145 (50 seats)

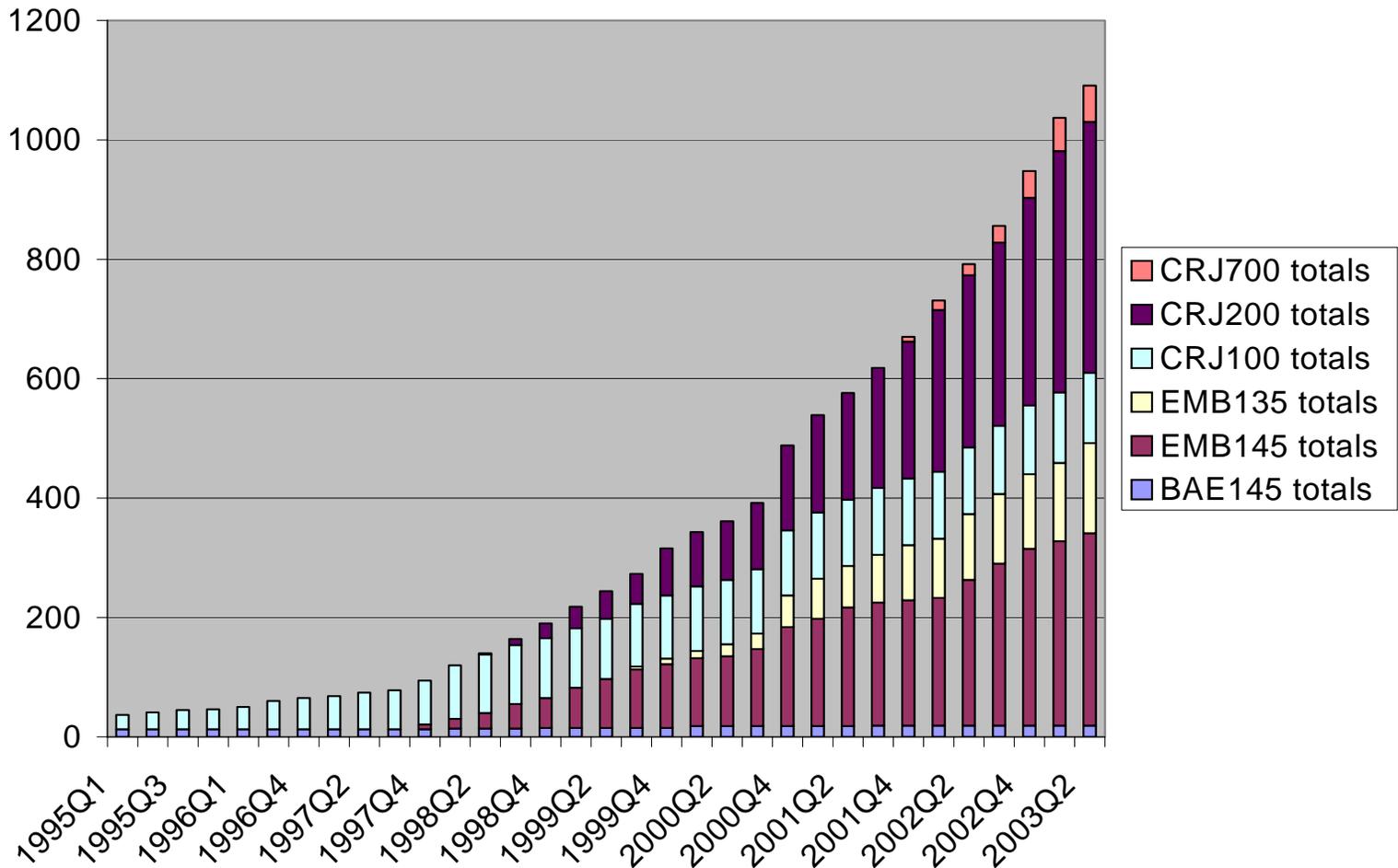


CRJ 200 (50 seats)





U.S. Regional Jet Growth



Source: FAA registration data from 1995 until the present



U.S. Regional Jet Carriers and Code Share Partners

Aircraft Type	Regional Carrier	Code Share Partners/Carriers
E135	American Eagle Continental Express Republic	American Continental America West, Delta, US Airways
E145	American Eagle Continental Express Mesa Republic Trans State	American Continental America West, Frontier, US Airways America West, Delta, USAirways America, US Airways
CRJ1	Comair Sky West	Delta Delta, United
CRJ2	Air Wisconsin Atlantic Southeast Mesa Sky West	Air Tran, United Delta America West, Frontier, US Airways Delta, United
CRJ7	American Eagle Atlantic Southeast Comair Horizon Mesa	American Delta Delta Alaska, Northwest America West, Frontier, US Airways
BA46	Air Wisconsin Mesaba	Air Tran, United Northwest



Influences on Regional Jet Growth

❑ **Market Influences**

- Preference of regional jets to turboprops
- Ability to match aircraft size to small demand but high value markets

❑ **Code sharing between mainline and regional carriers**

- These code shares support the regional flights by paying a per departure fee to the regional carriers

❑ **Scope clauses**

- Scope clauses are part of the labor agreements between airlines and pilots and limit the number and utilization of regional jets
- Major airlines want to fly regional jets because of lower crew costs

❑ **Impact of 9/11?**

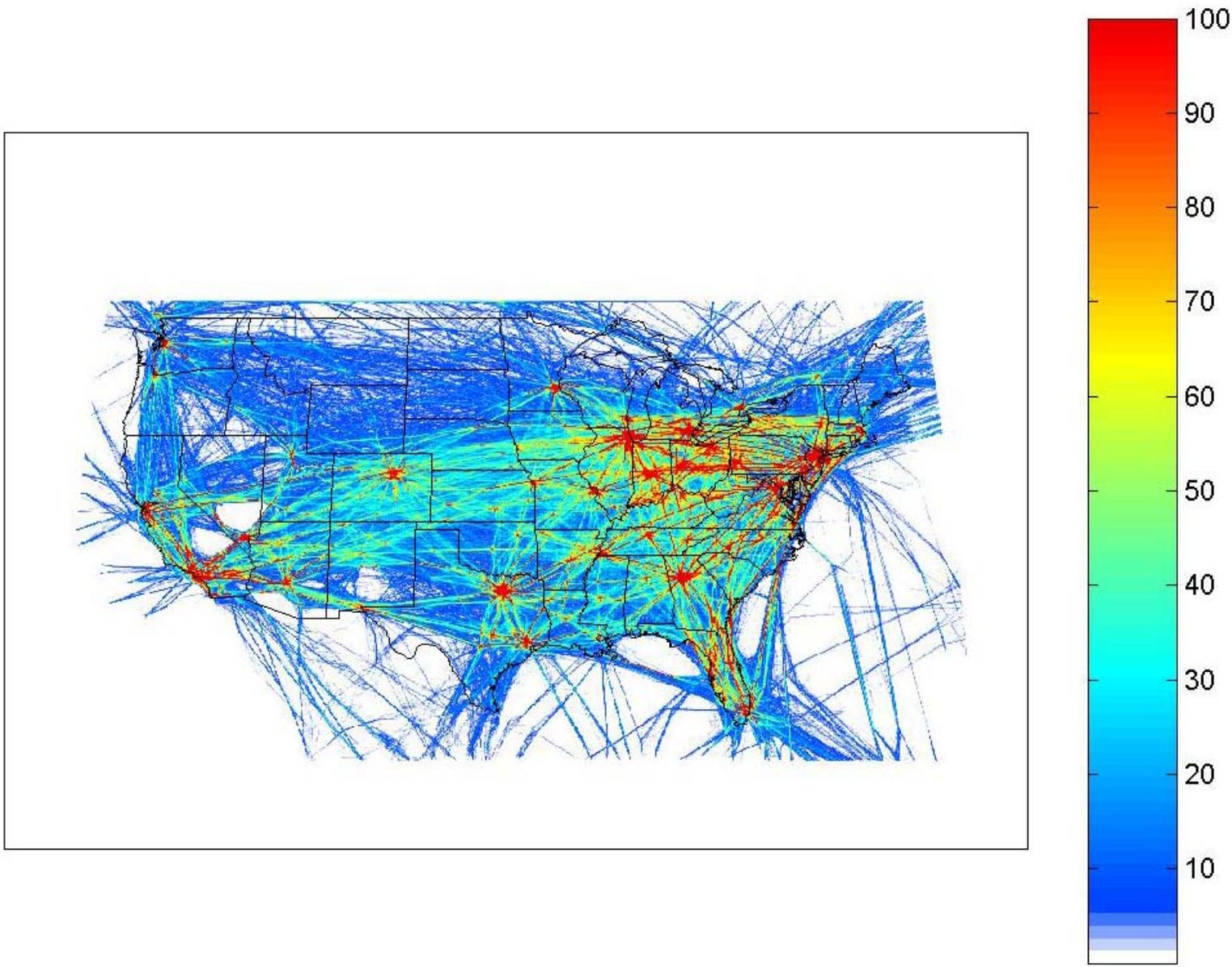


Regional Jet Flight Patterns in the U.S.

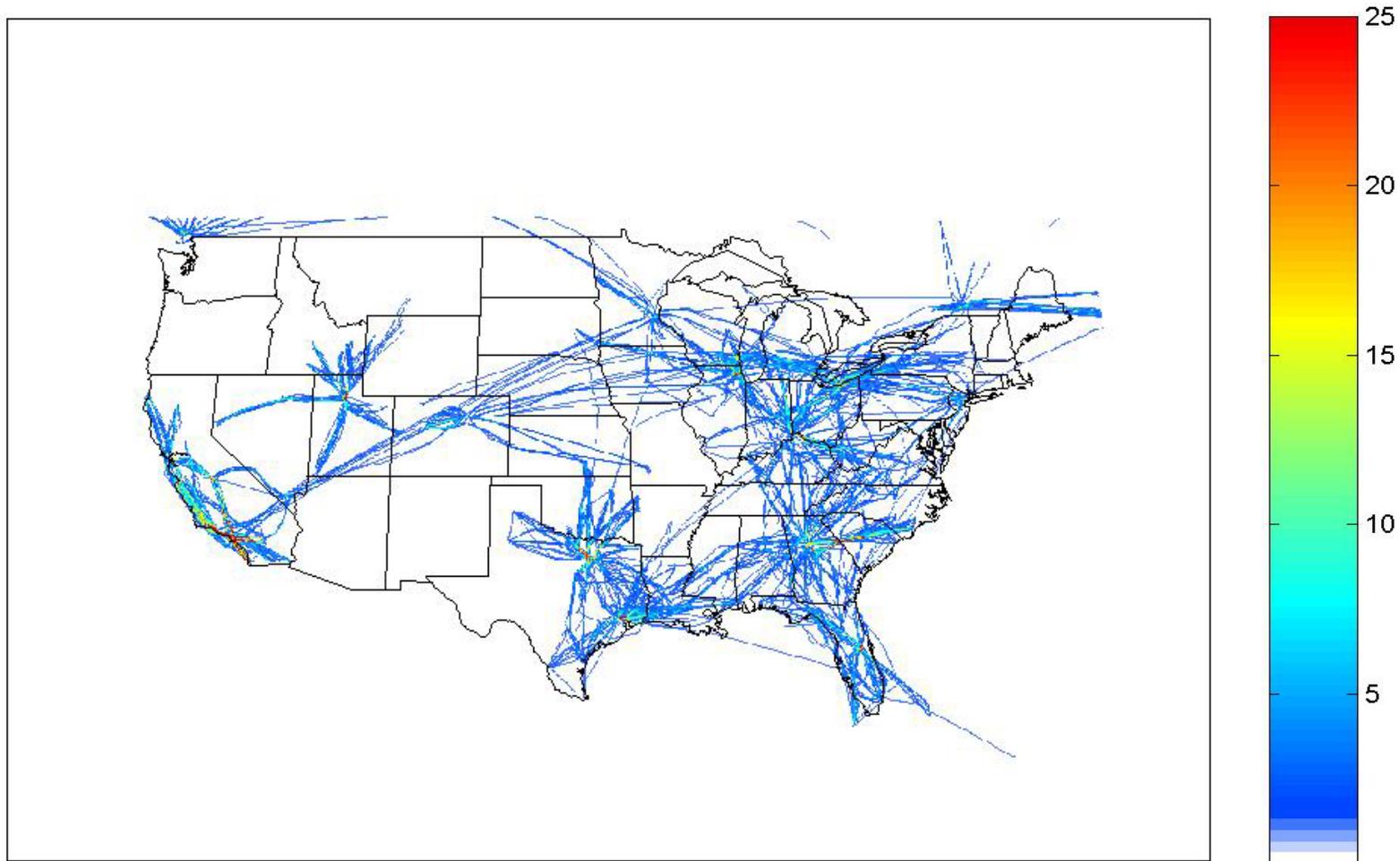
(based on Enhanced Traffic Management System (ETMS) data)

ETMS data includes the flight path of any aircraft tracked by the air traffic control system

Density Map: 24 hours of US flights

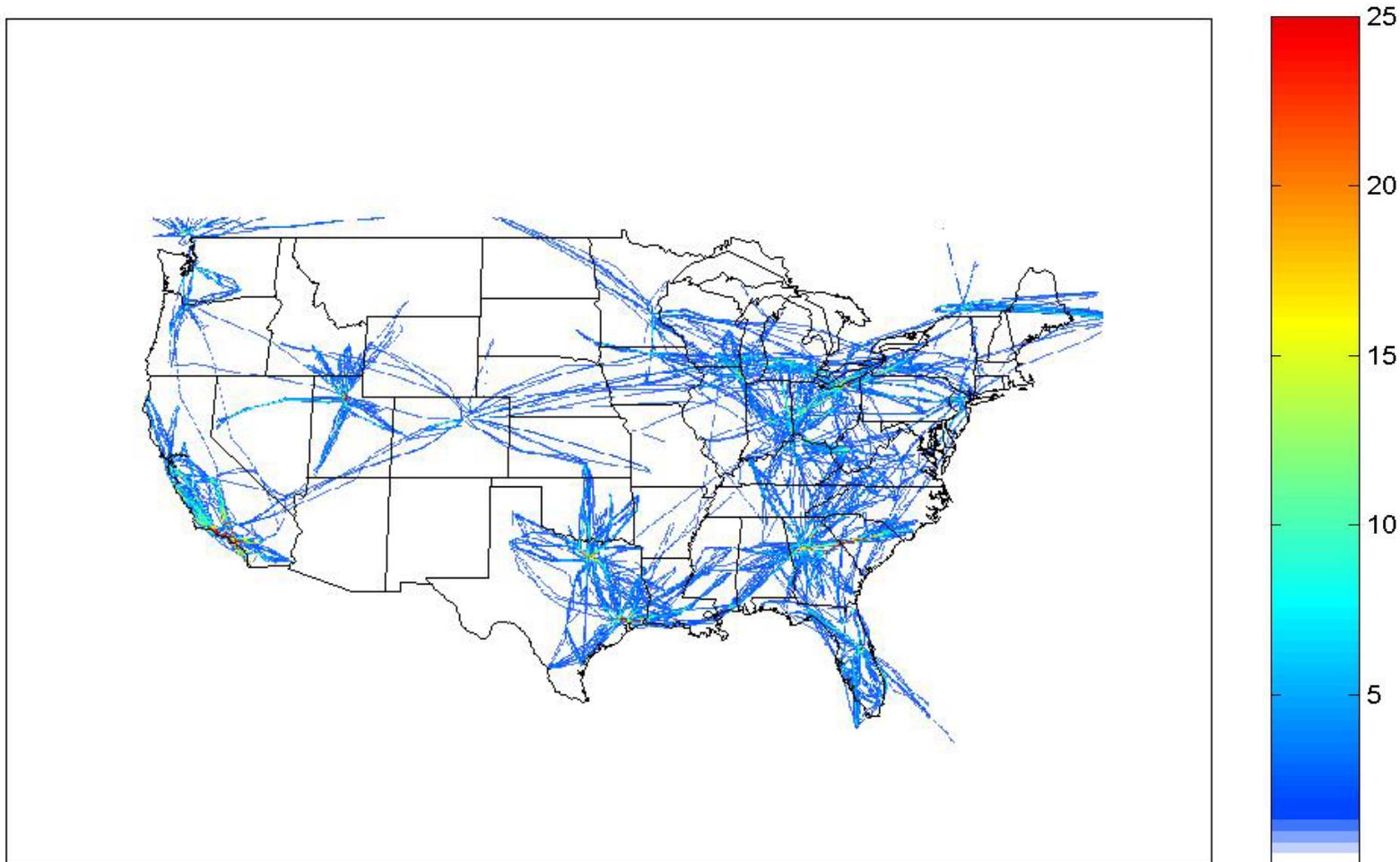


Regional Jet Density Growth



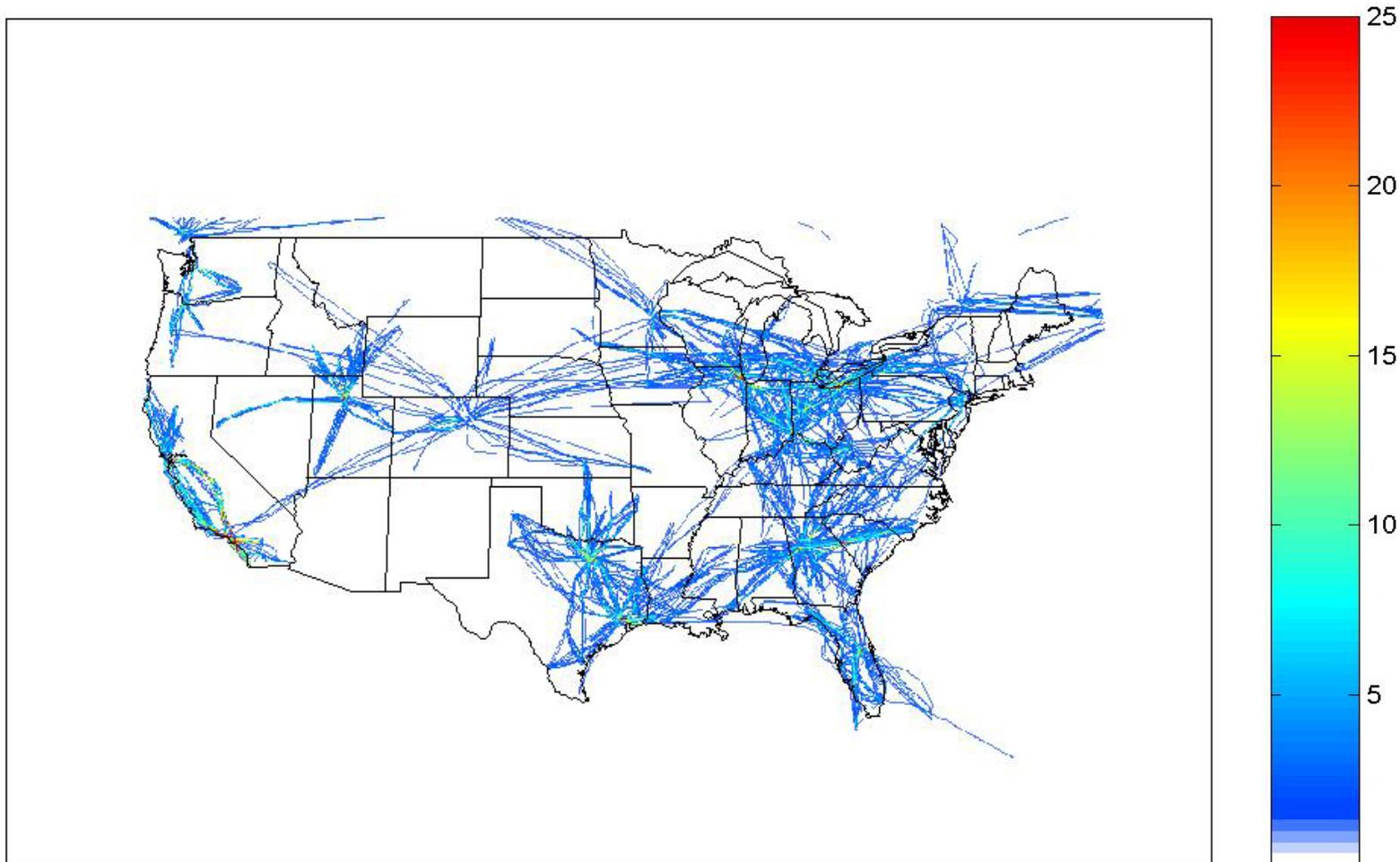
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Regional Jet Density Growth



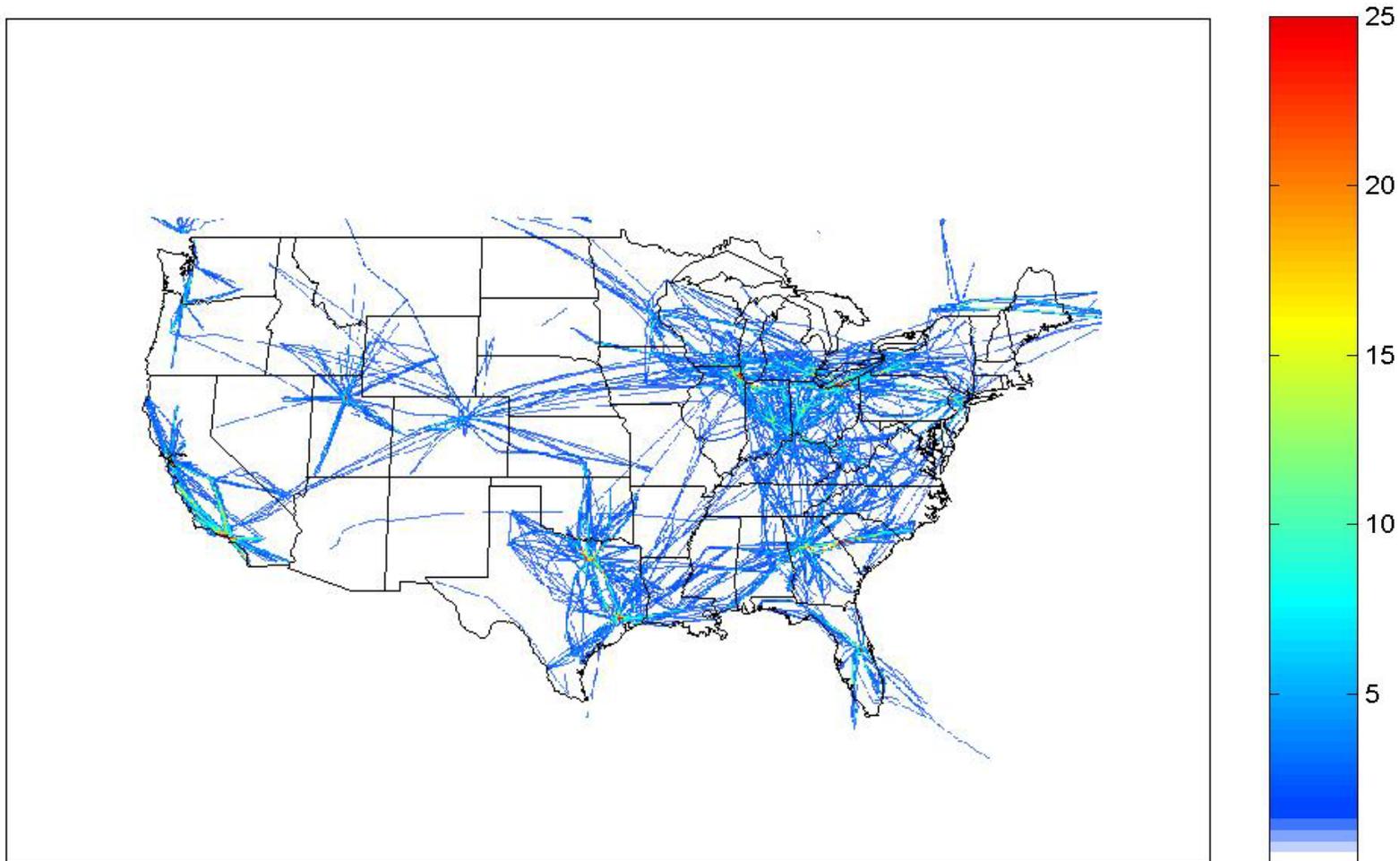
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Regional Jet Density Growth



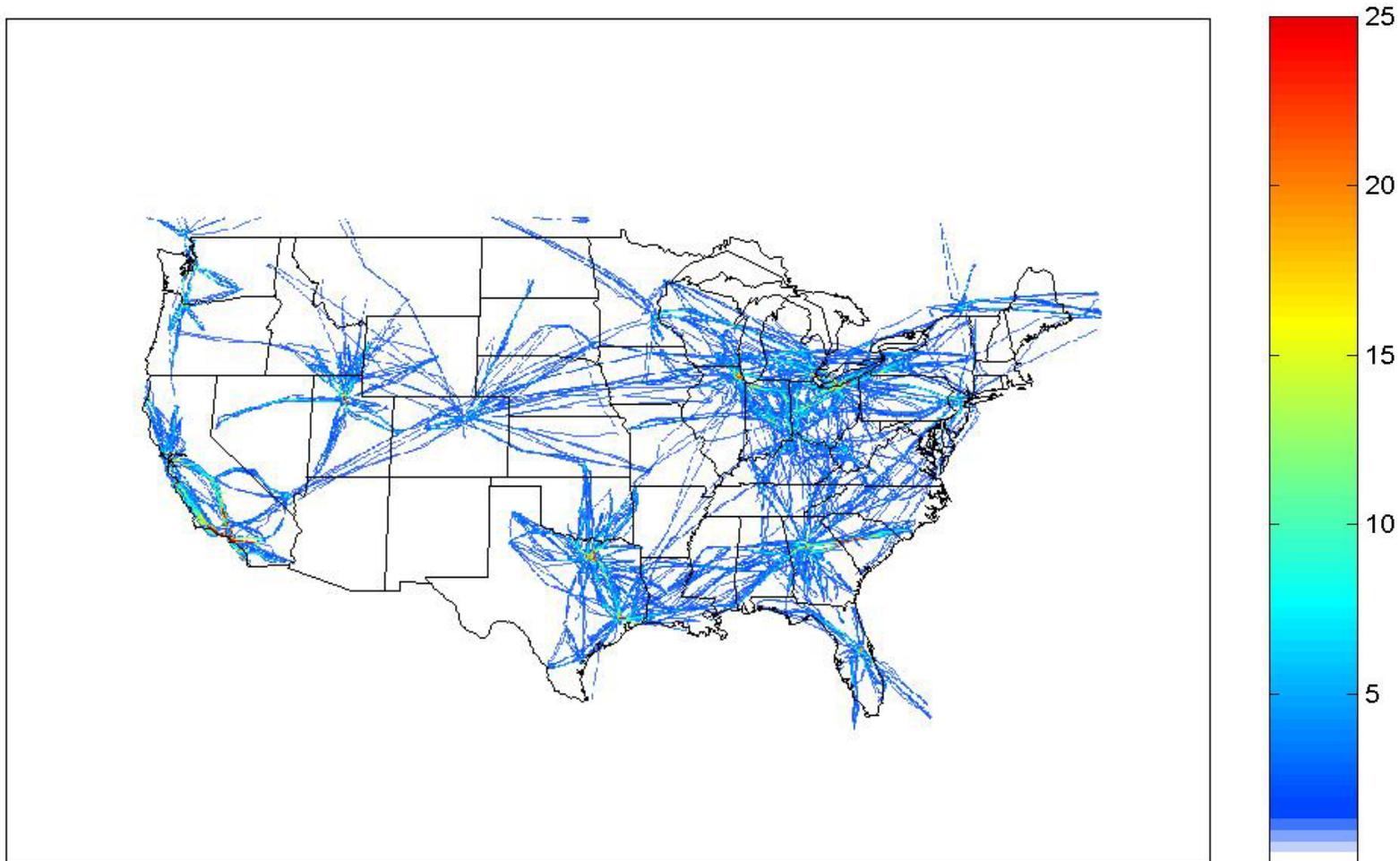
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Regional Jet Density Growth



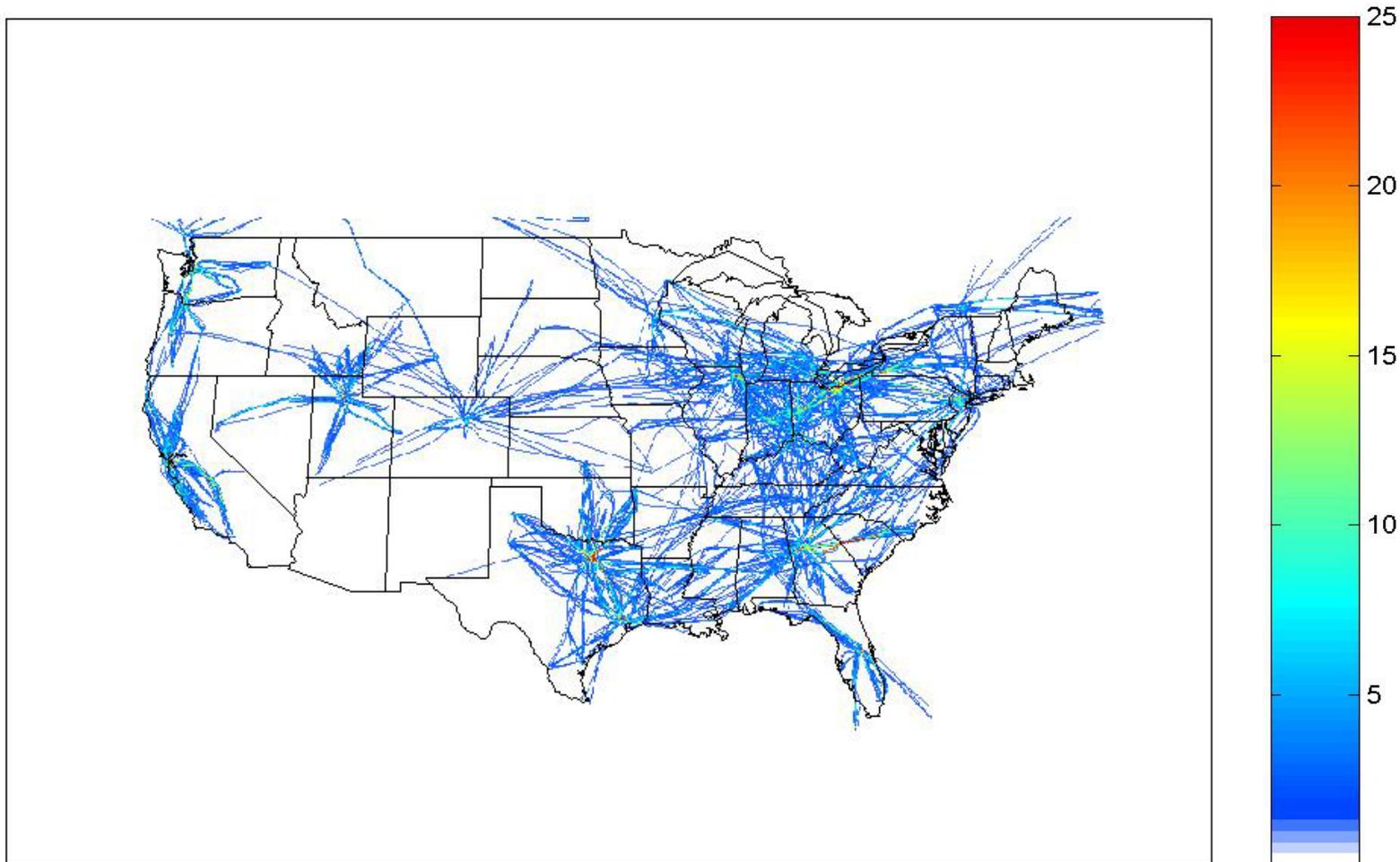
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Regional Jet Density Growth



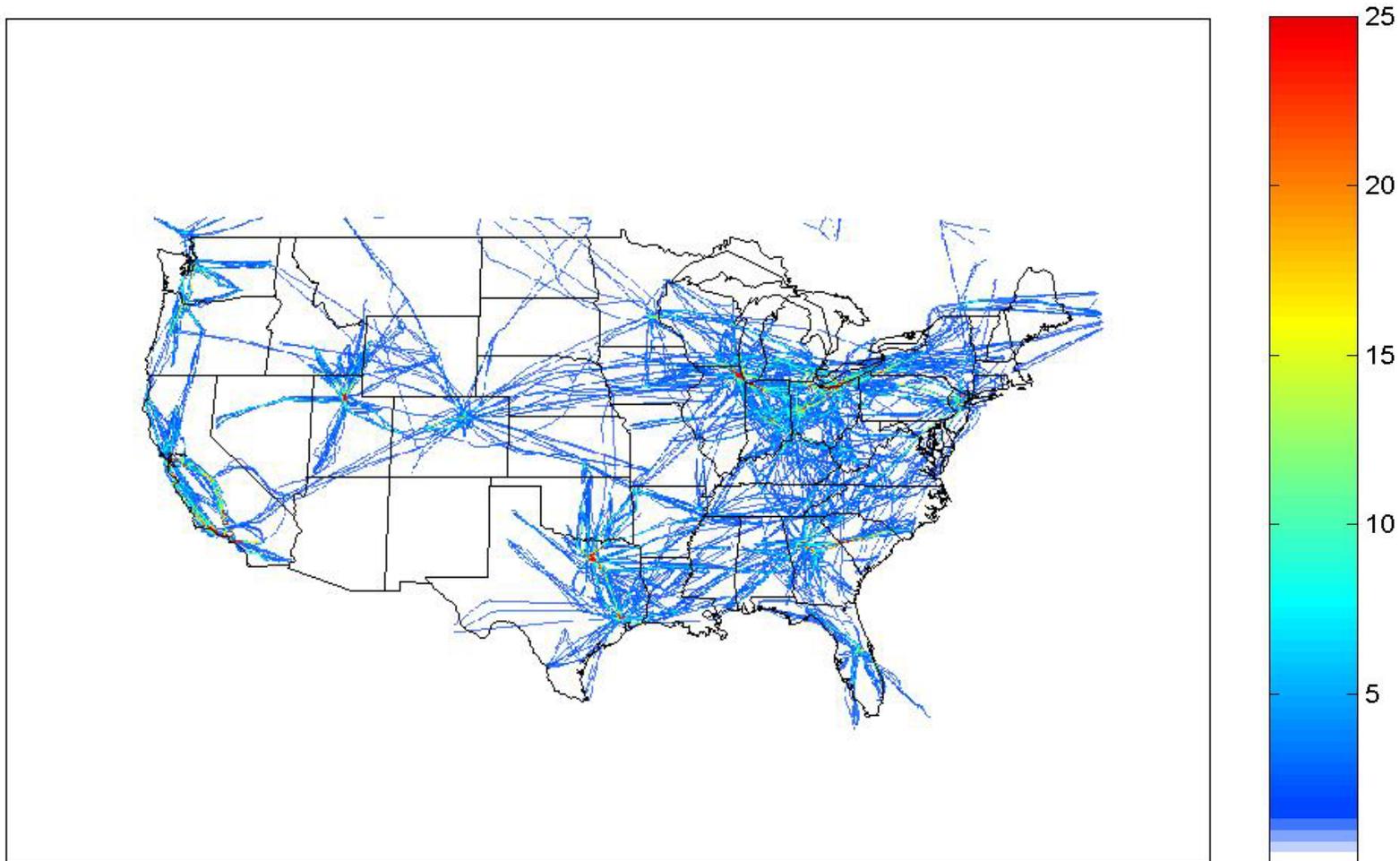
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Regional Jet Density Growth



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Regional Jet Density Growth



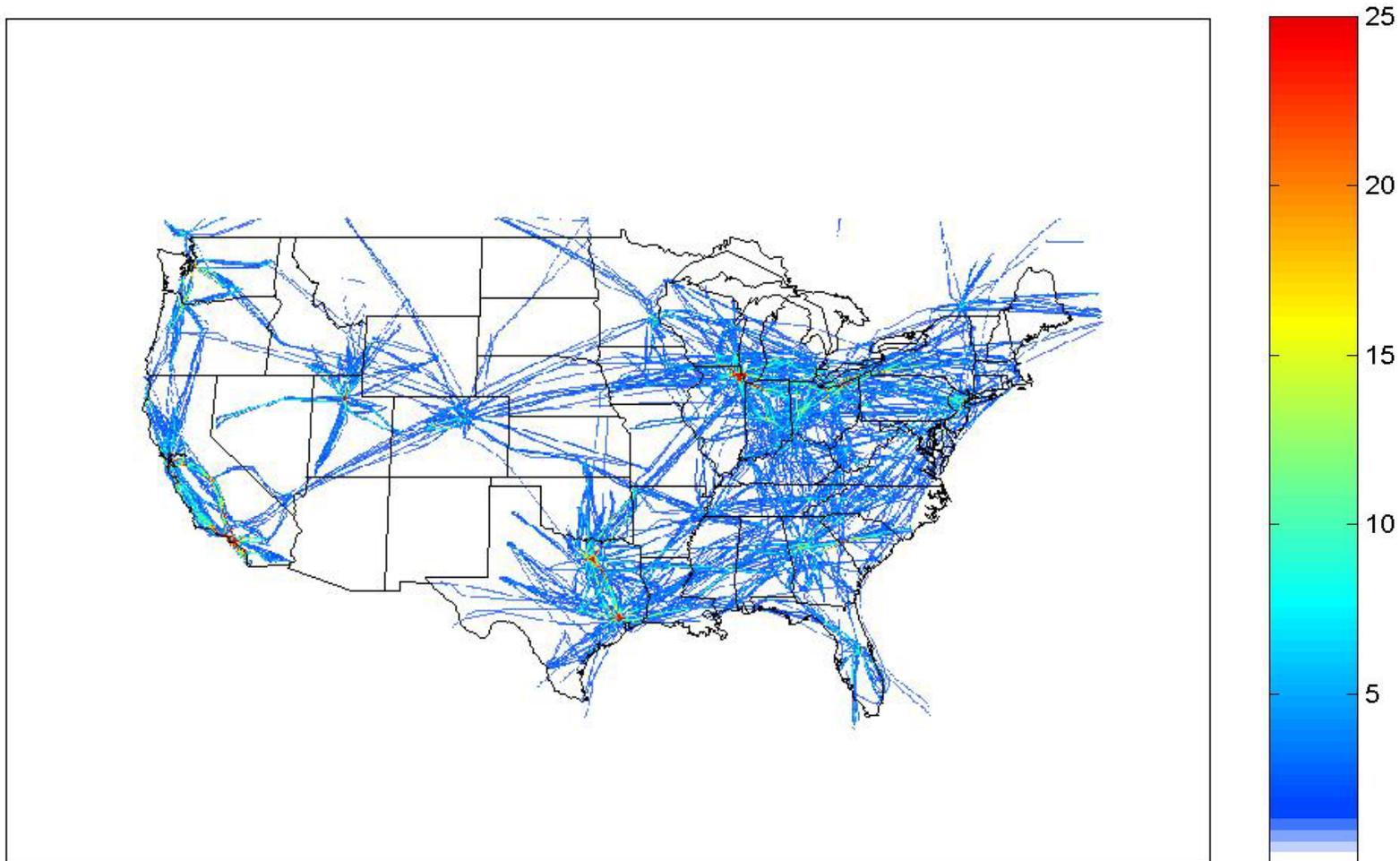
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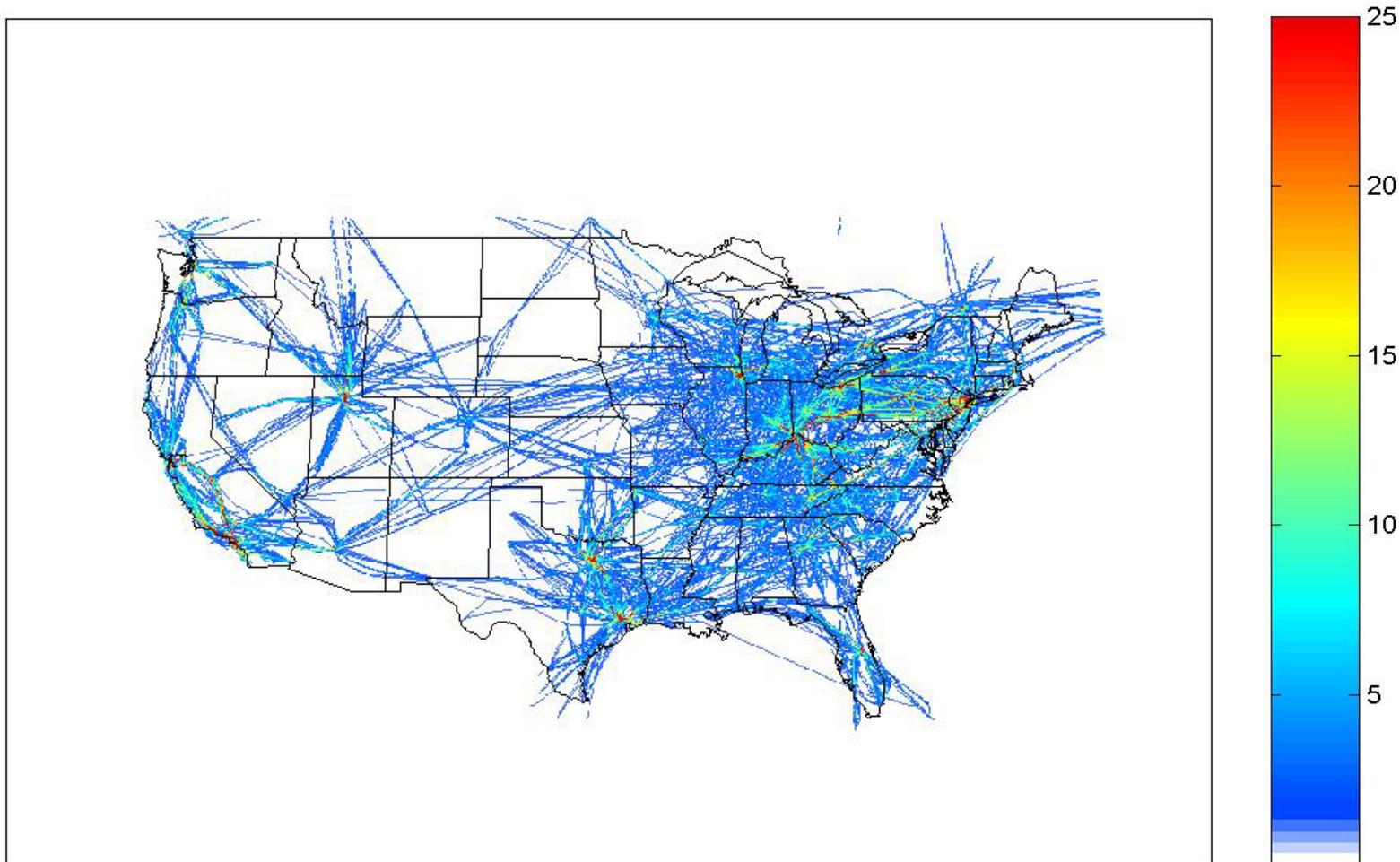
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Regional Jet Density Growth



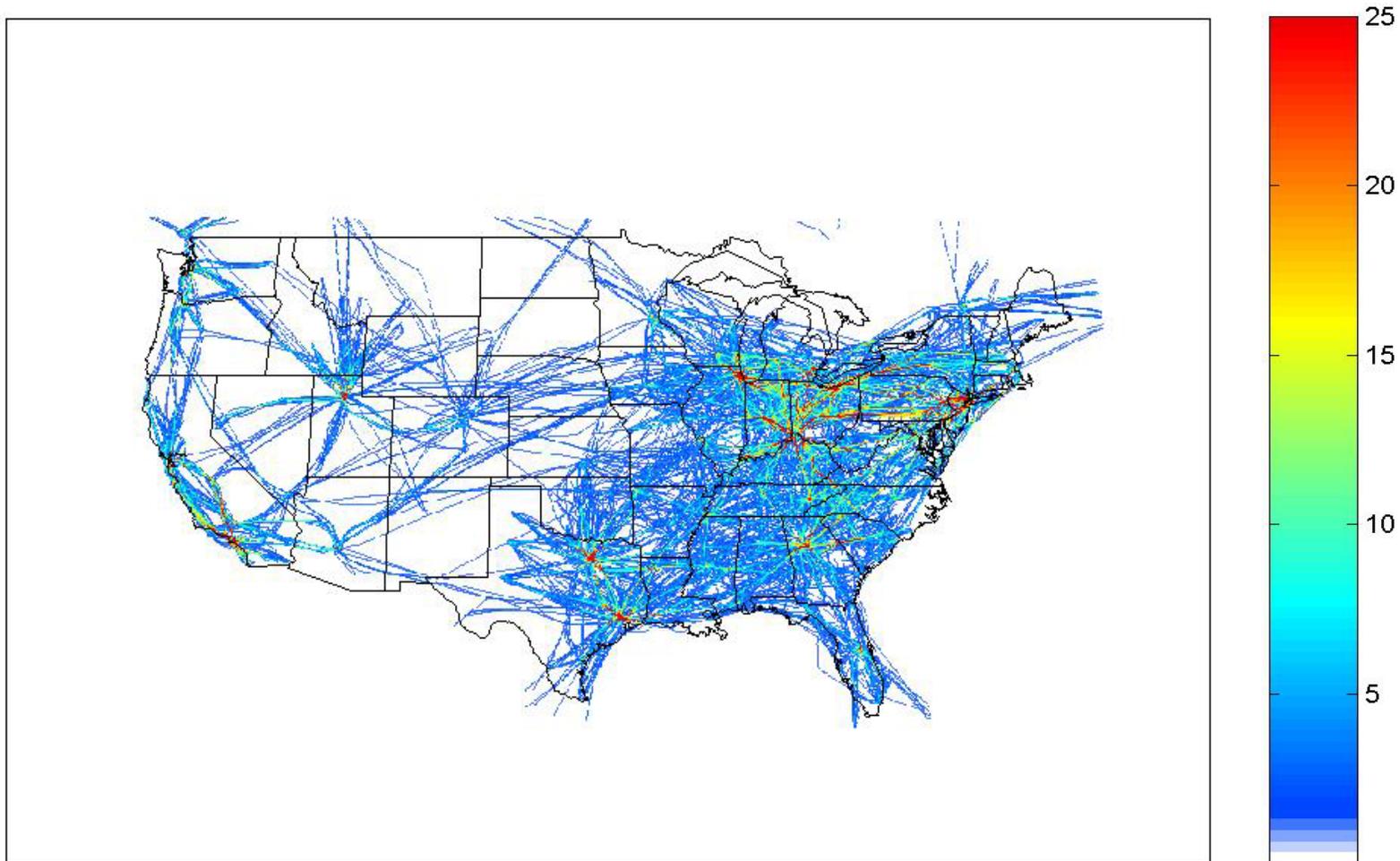
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Regional Jet Density Growth



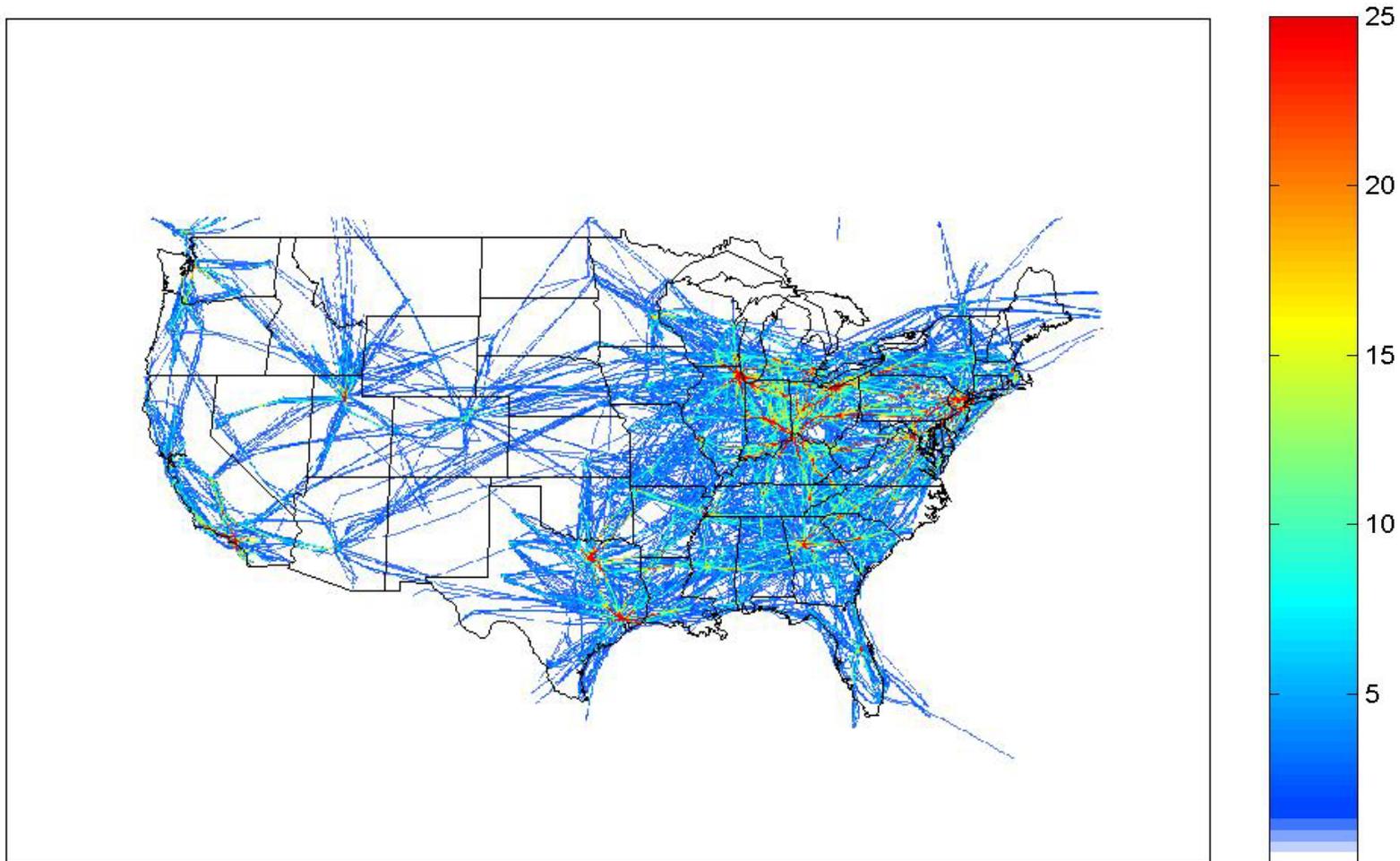
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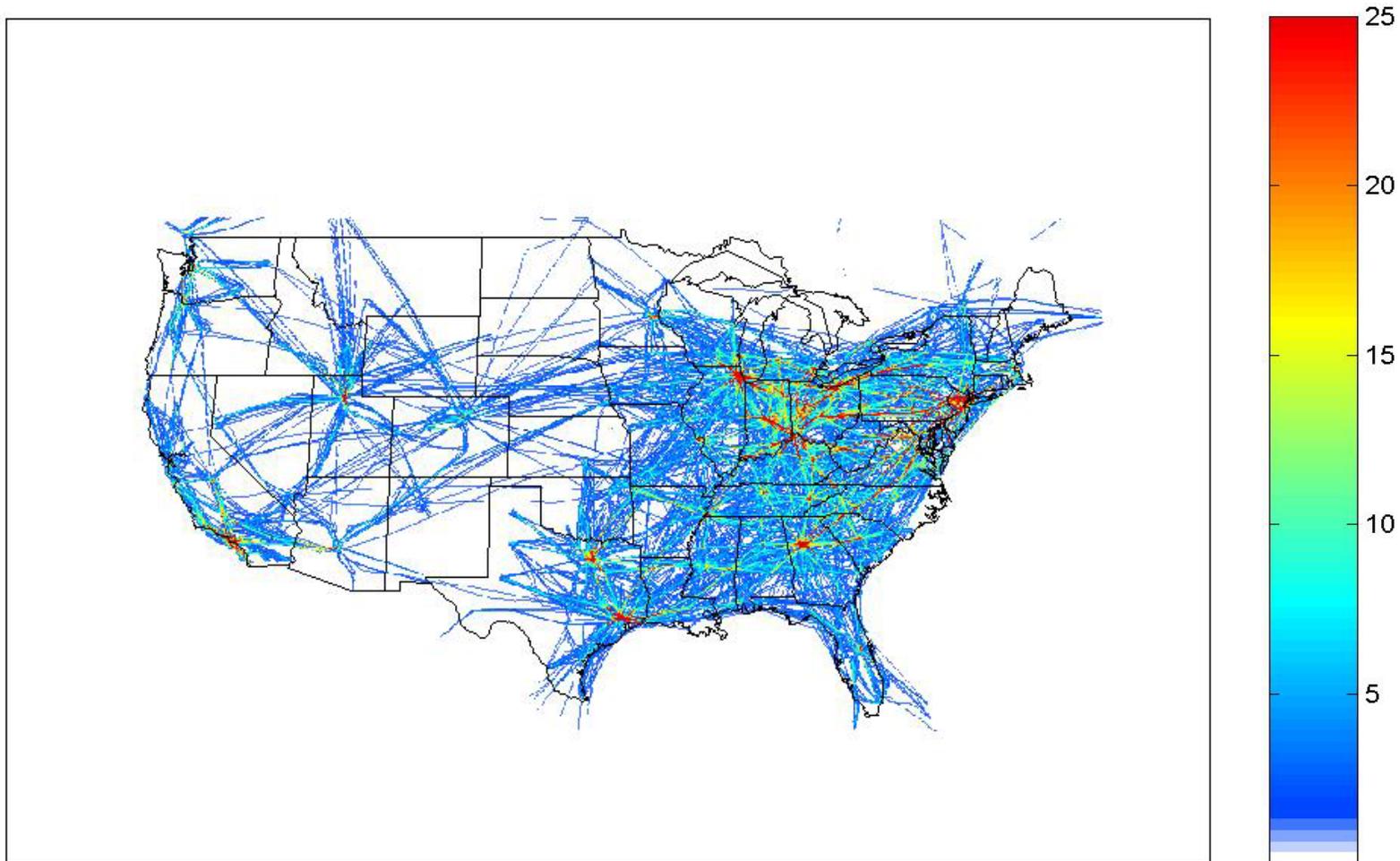
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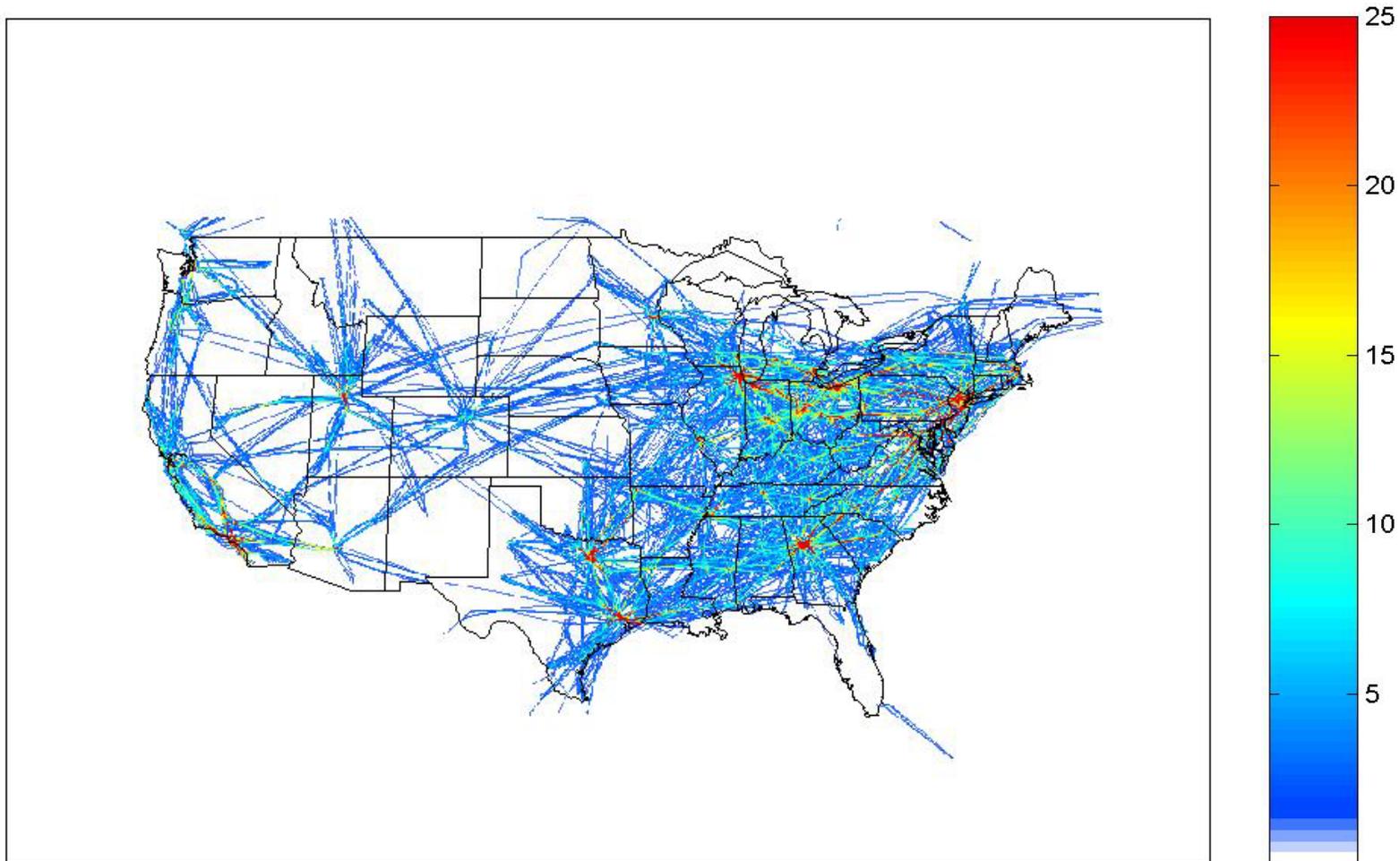
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Regional Jet Density Growth



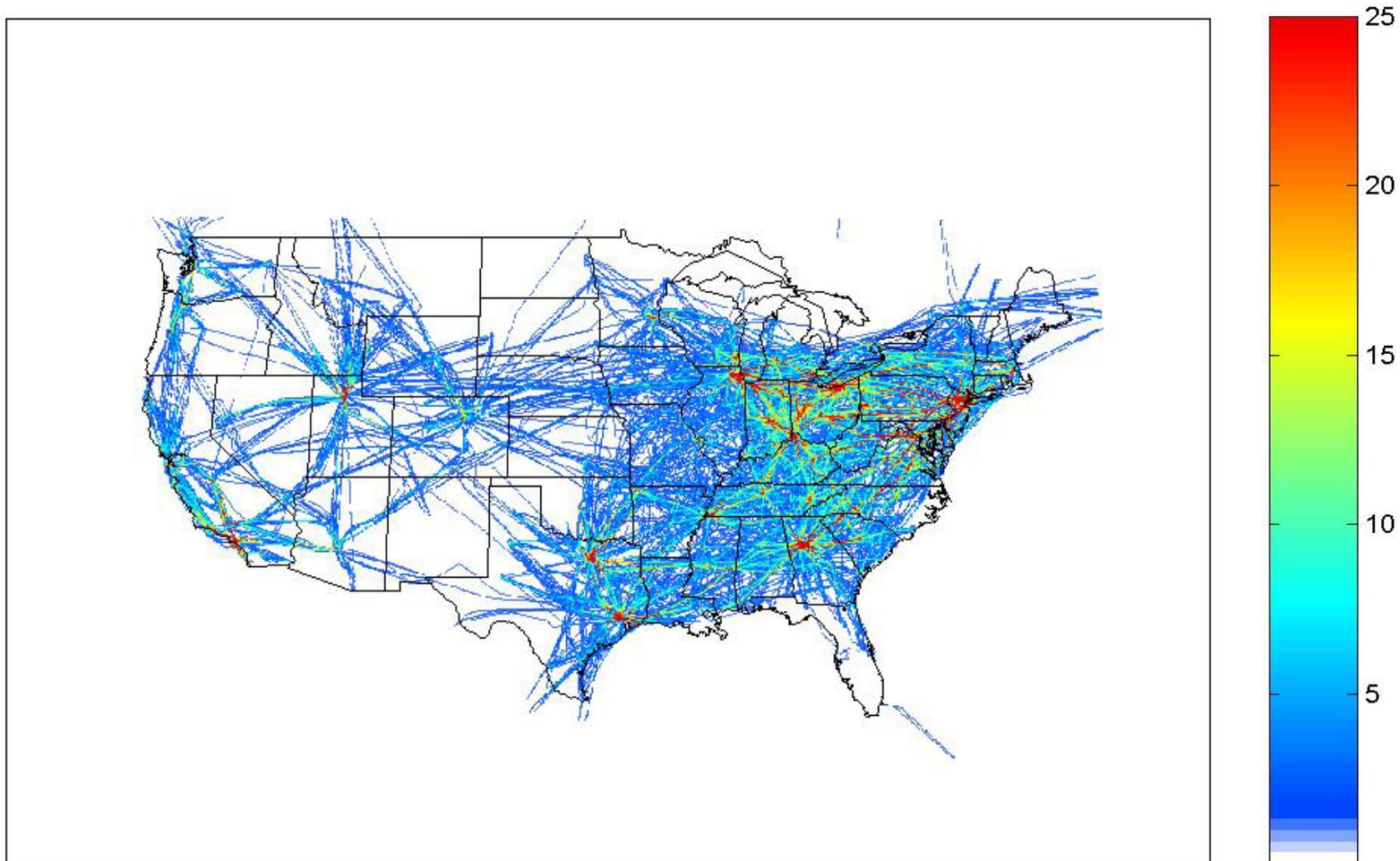
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Regional Jet Density Growth



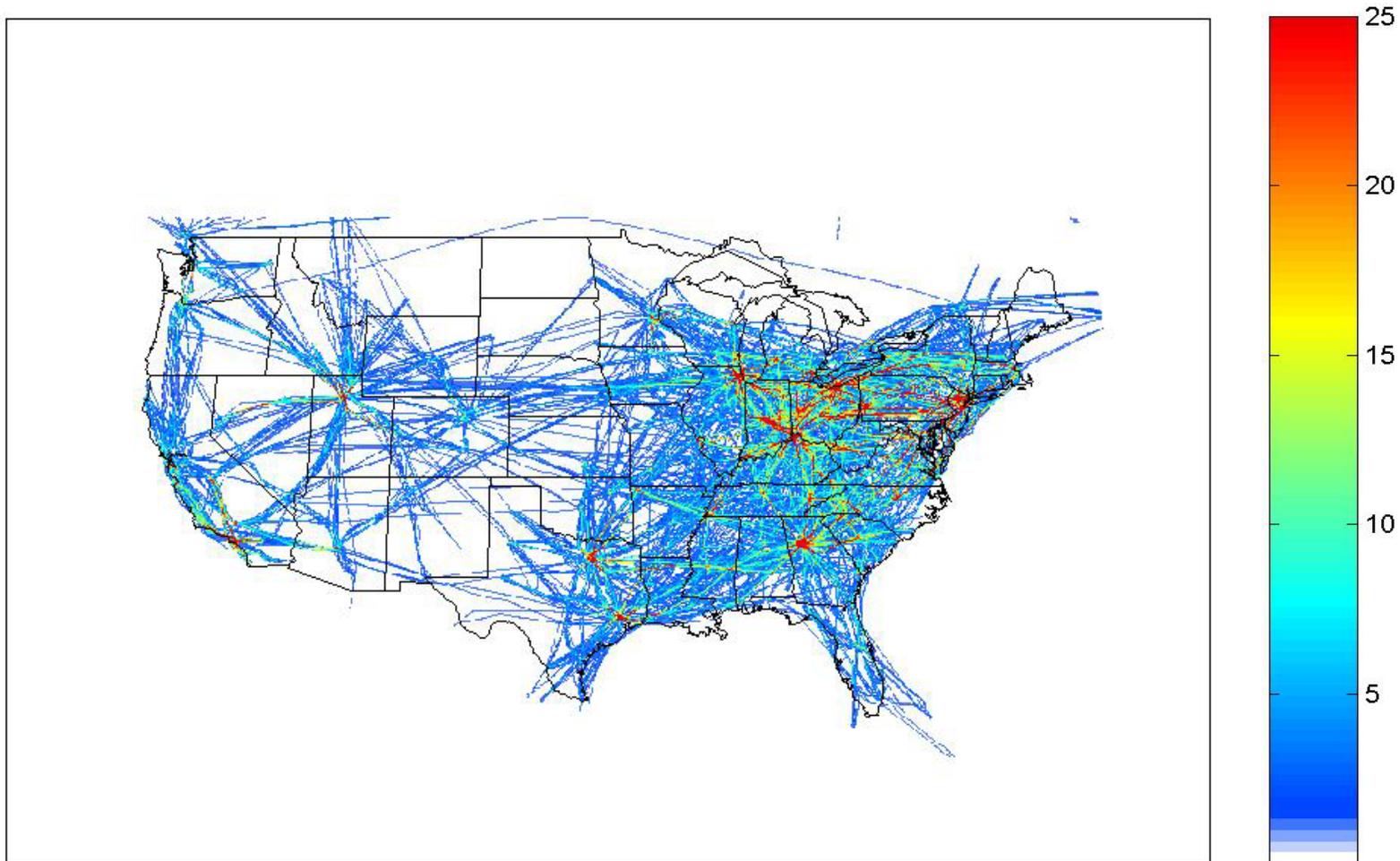
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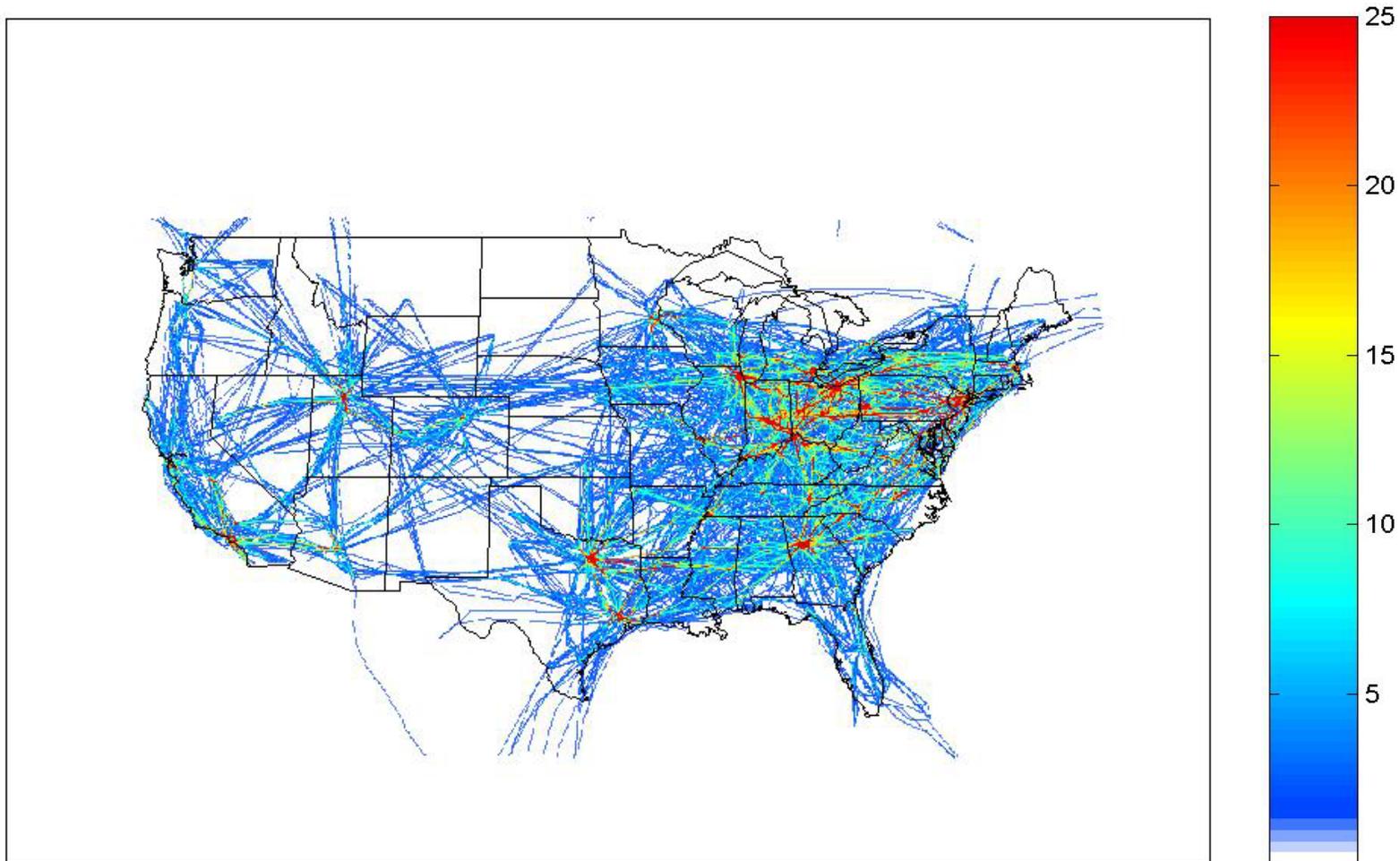
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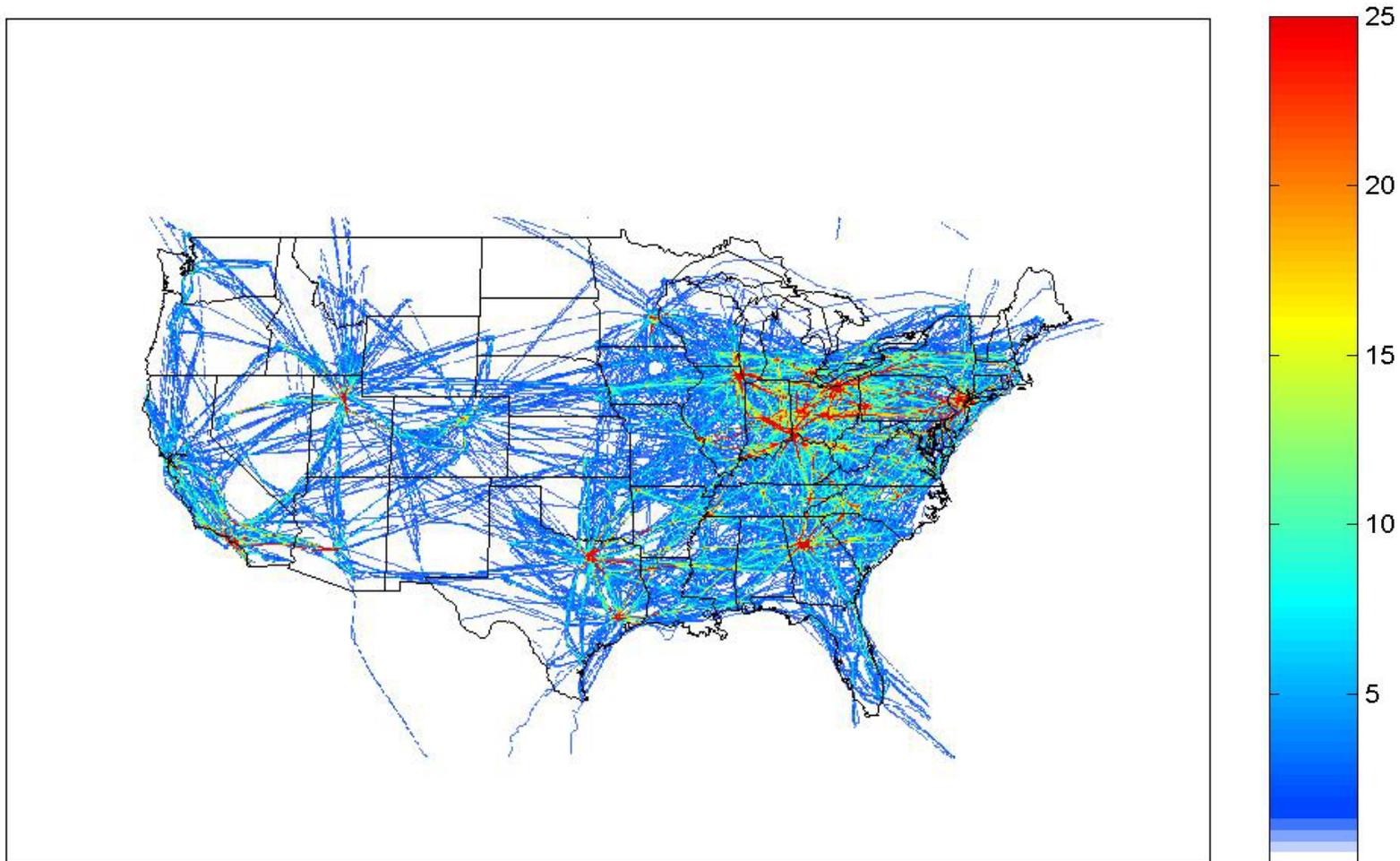
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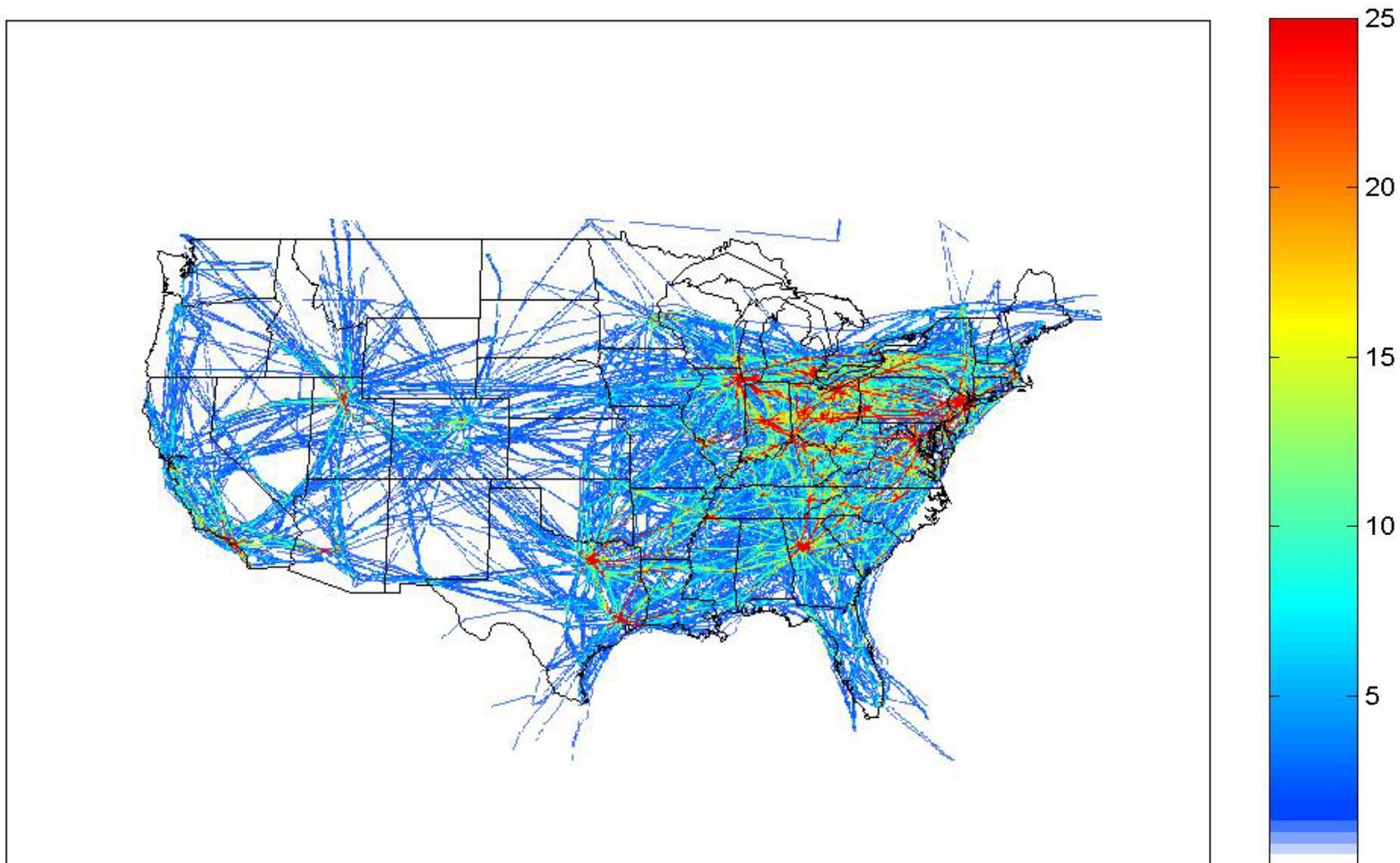
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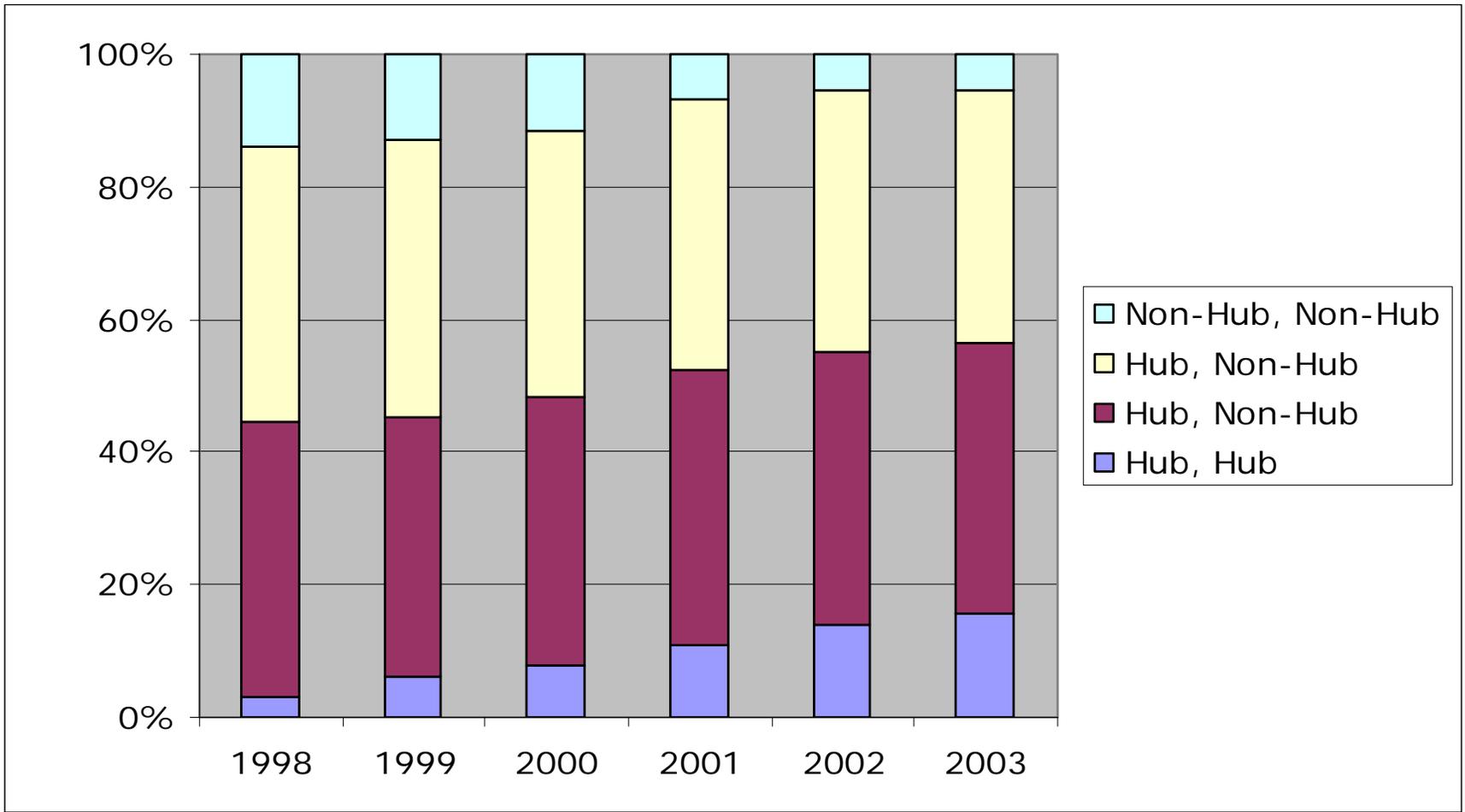
Regional Jet Density Growth



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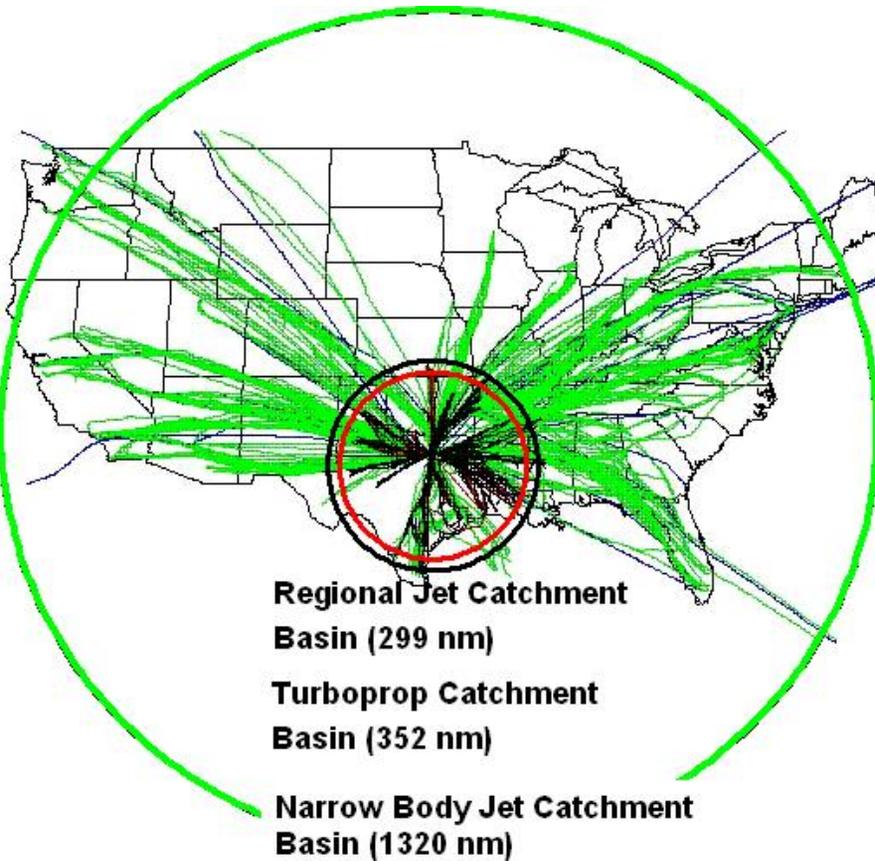


Percentage of Regional Jets Flown between Hub, and Non-Hub Airports

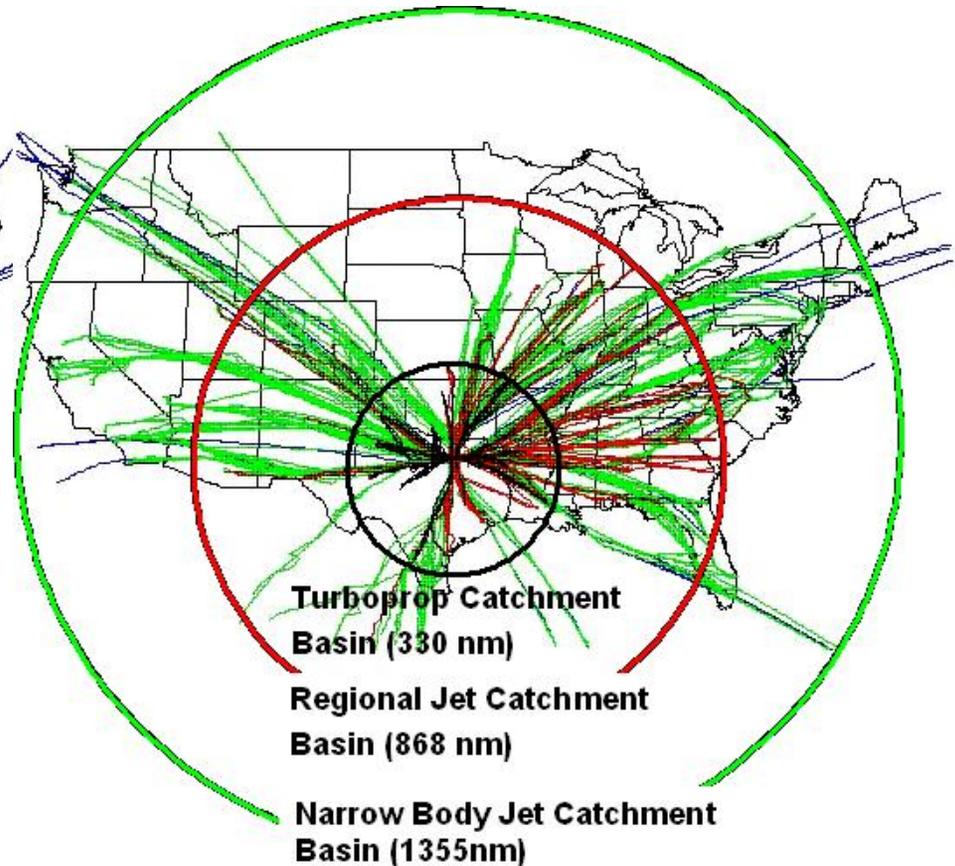


- About 90% of regional jet flights depart from or arrive at a hub airport

Dallas Fort Worth Departures



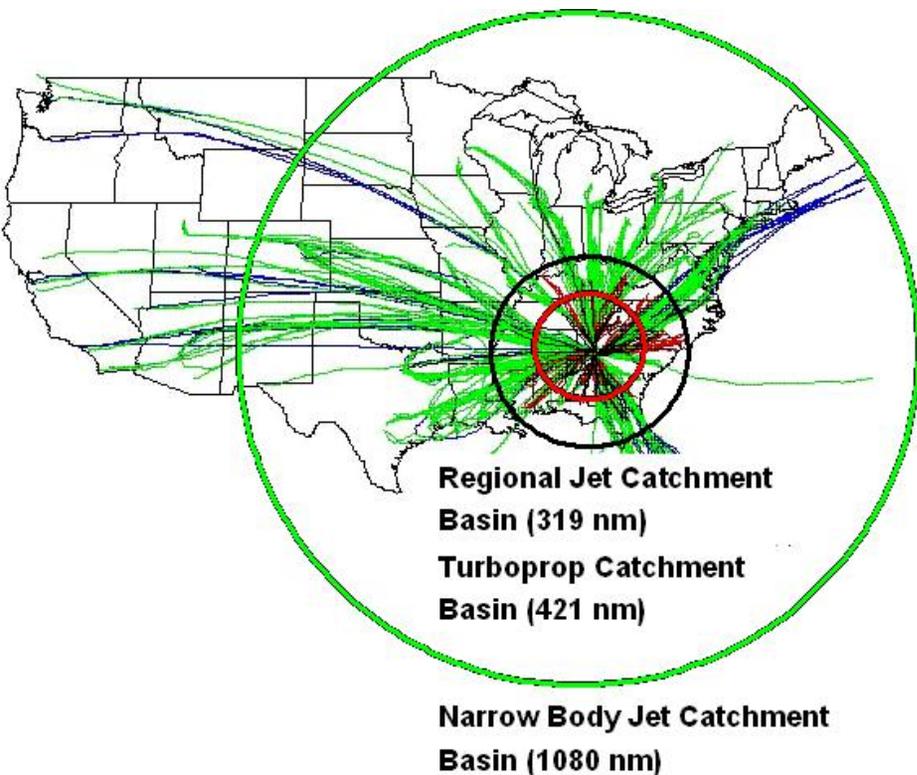
January 1998



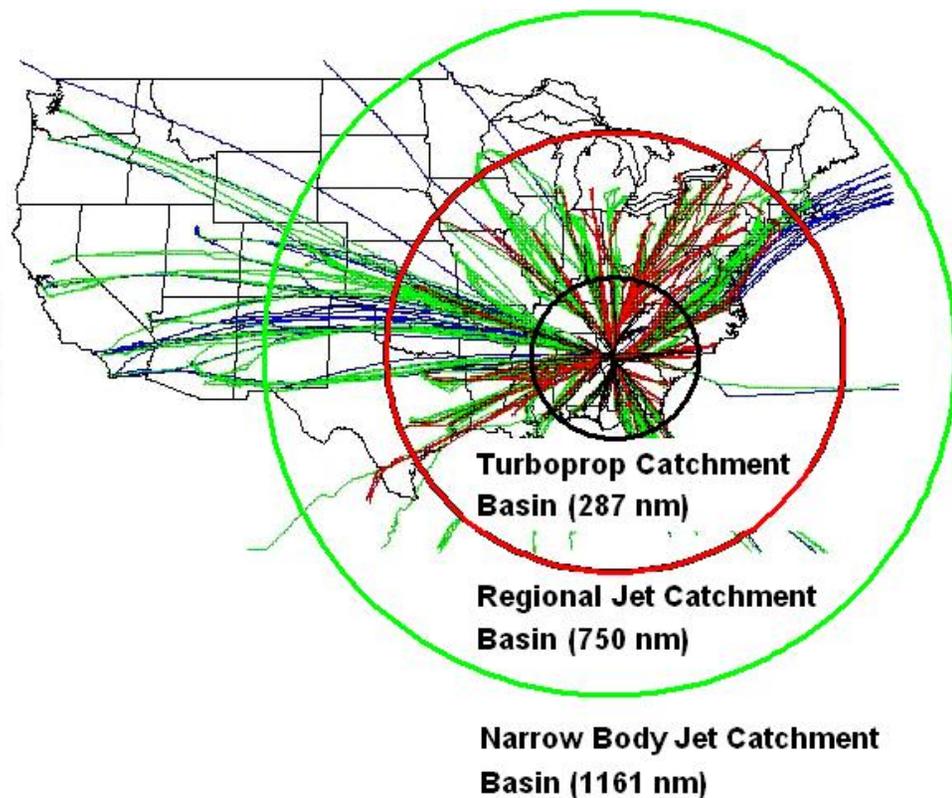
January 2003

Catchment basin defined as the radius that captures 95% of flights

Atlanta Departures

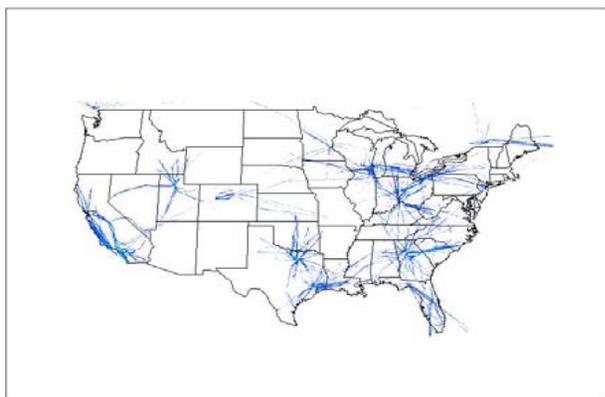


January 1998

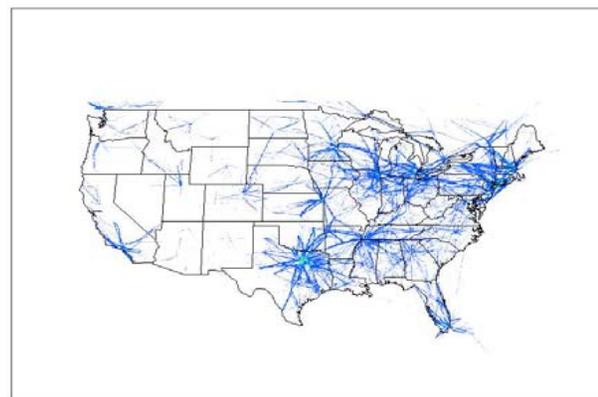


January 2003

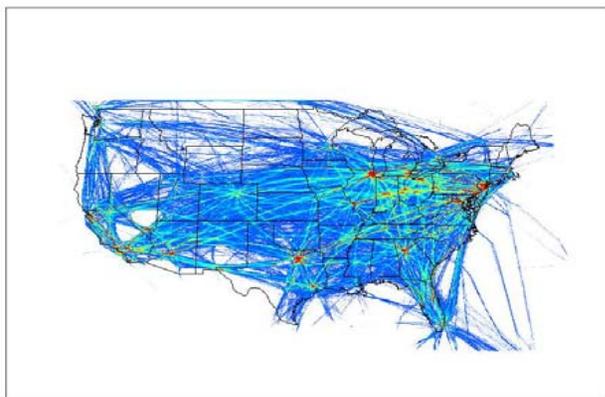
January 1998 Density for each Aircraft Category



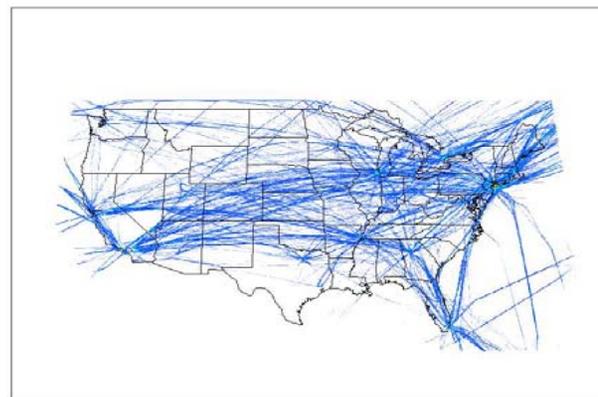
Regional Jets



Turboprops

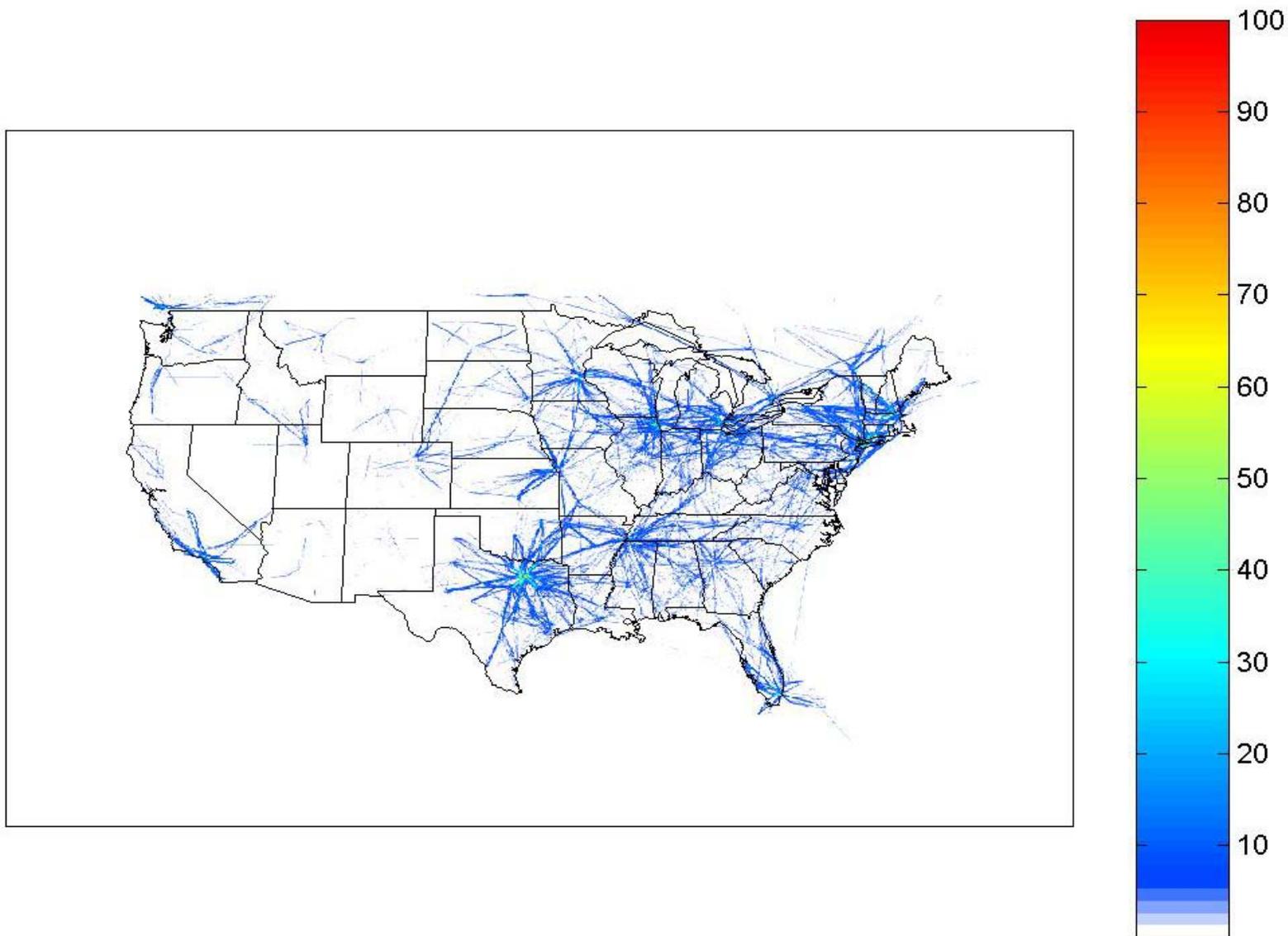


Narrow Body Traditional Jets



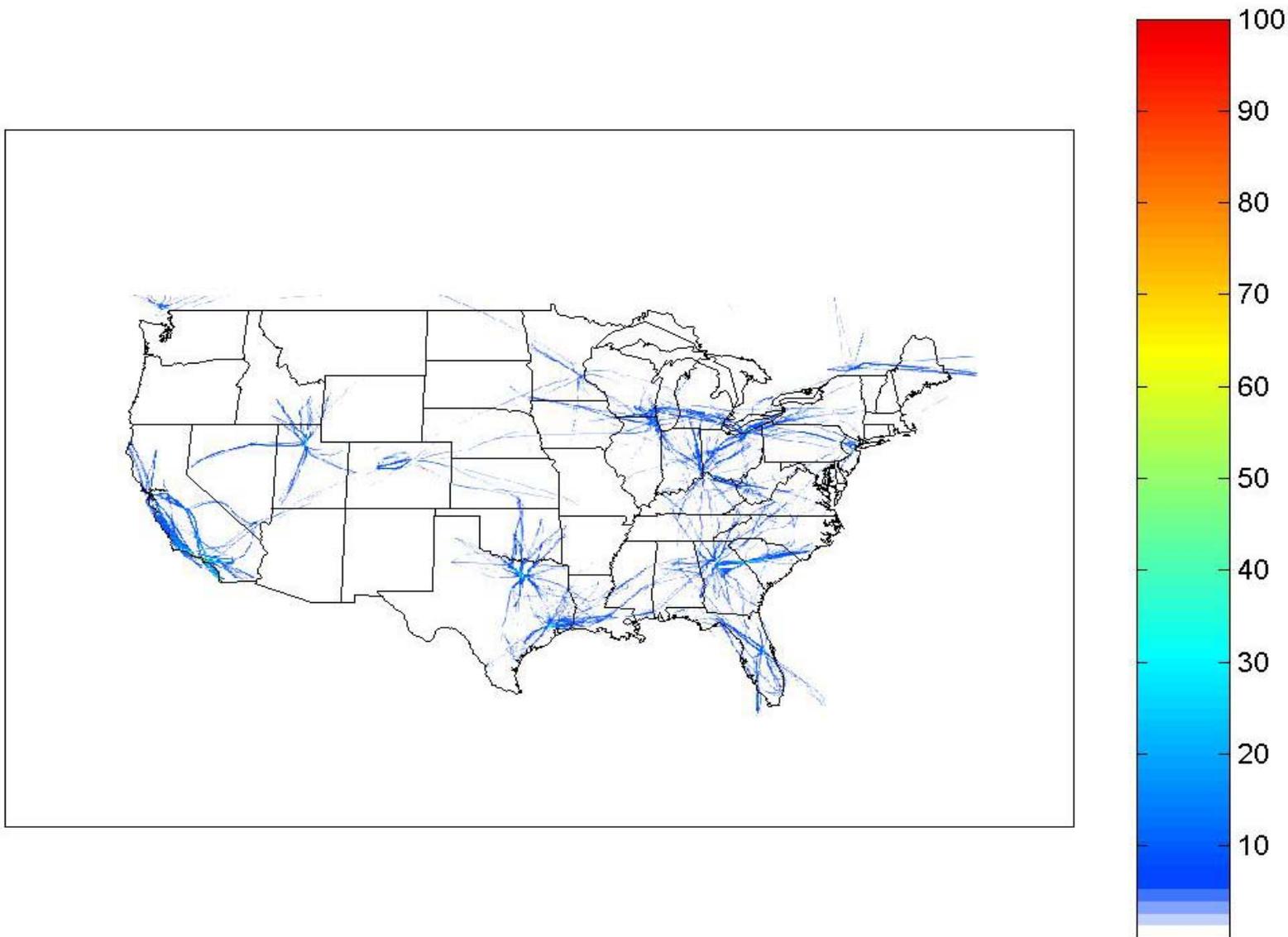
Wide Body Traditional Jets

January 1998 Turboprop Density

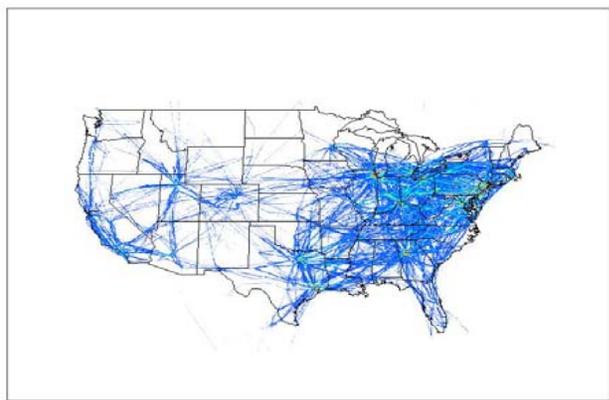




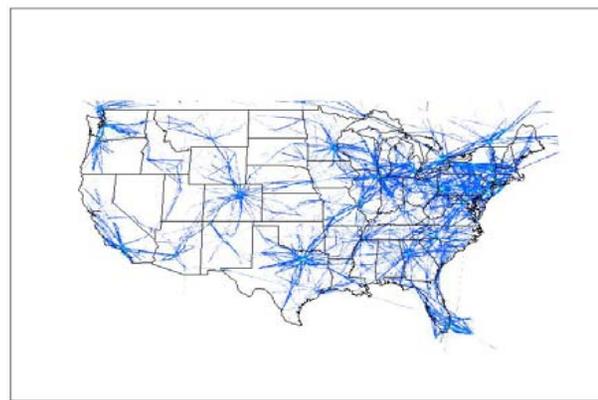
January 1998 Regional Jet Density



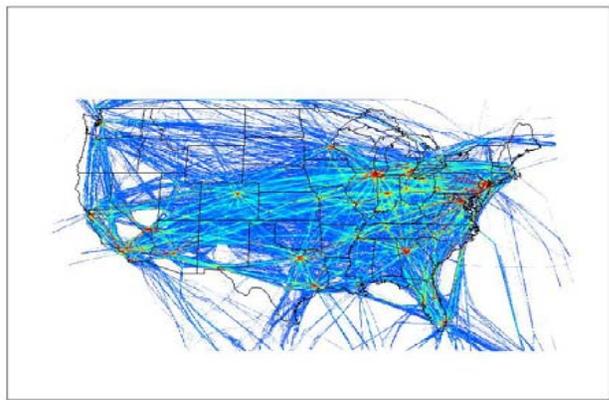
January 2003 Density for each Aircraft Category



Regional Jets



Turboprops

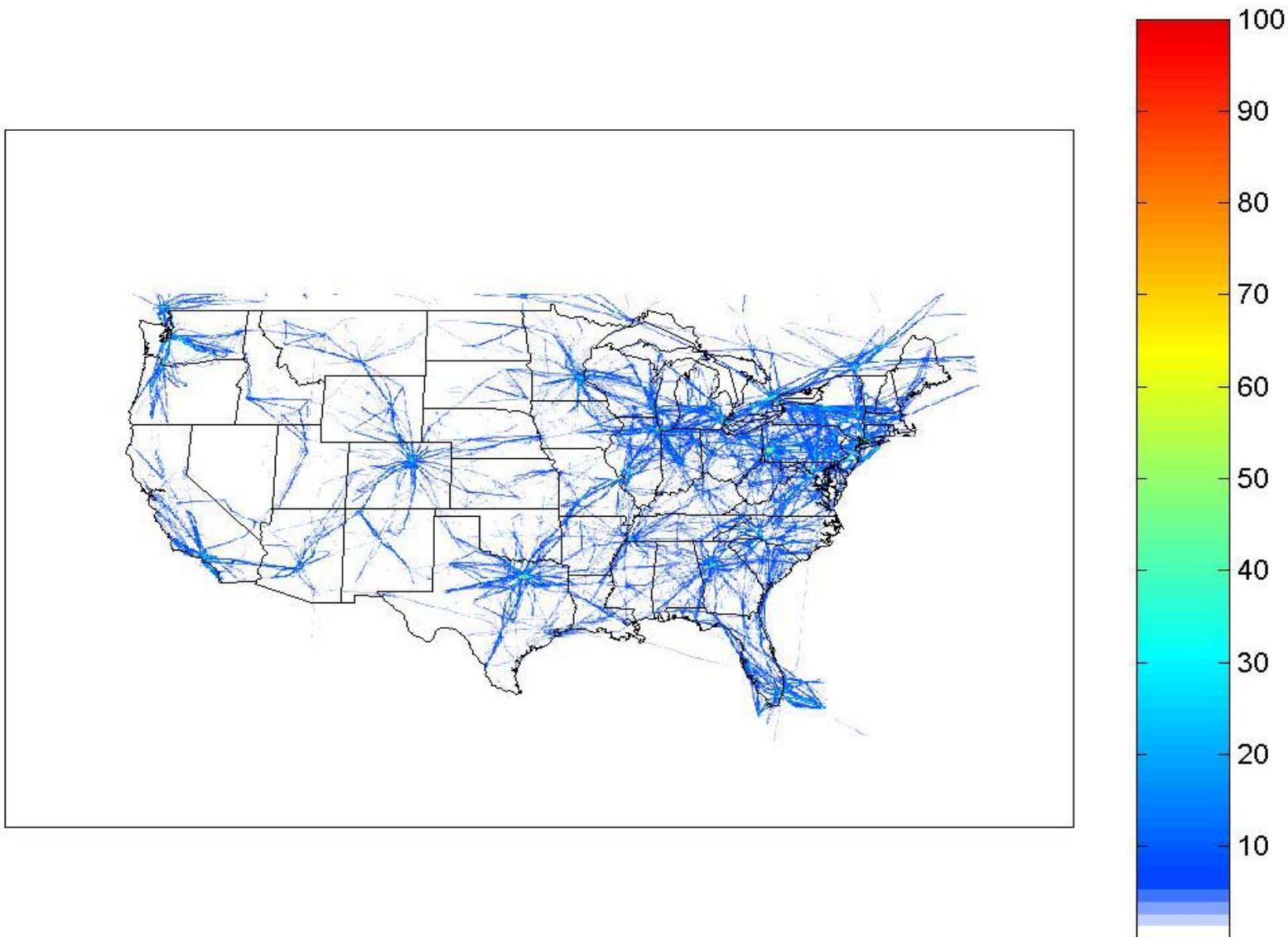


Narrow Body Traditional Jets

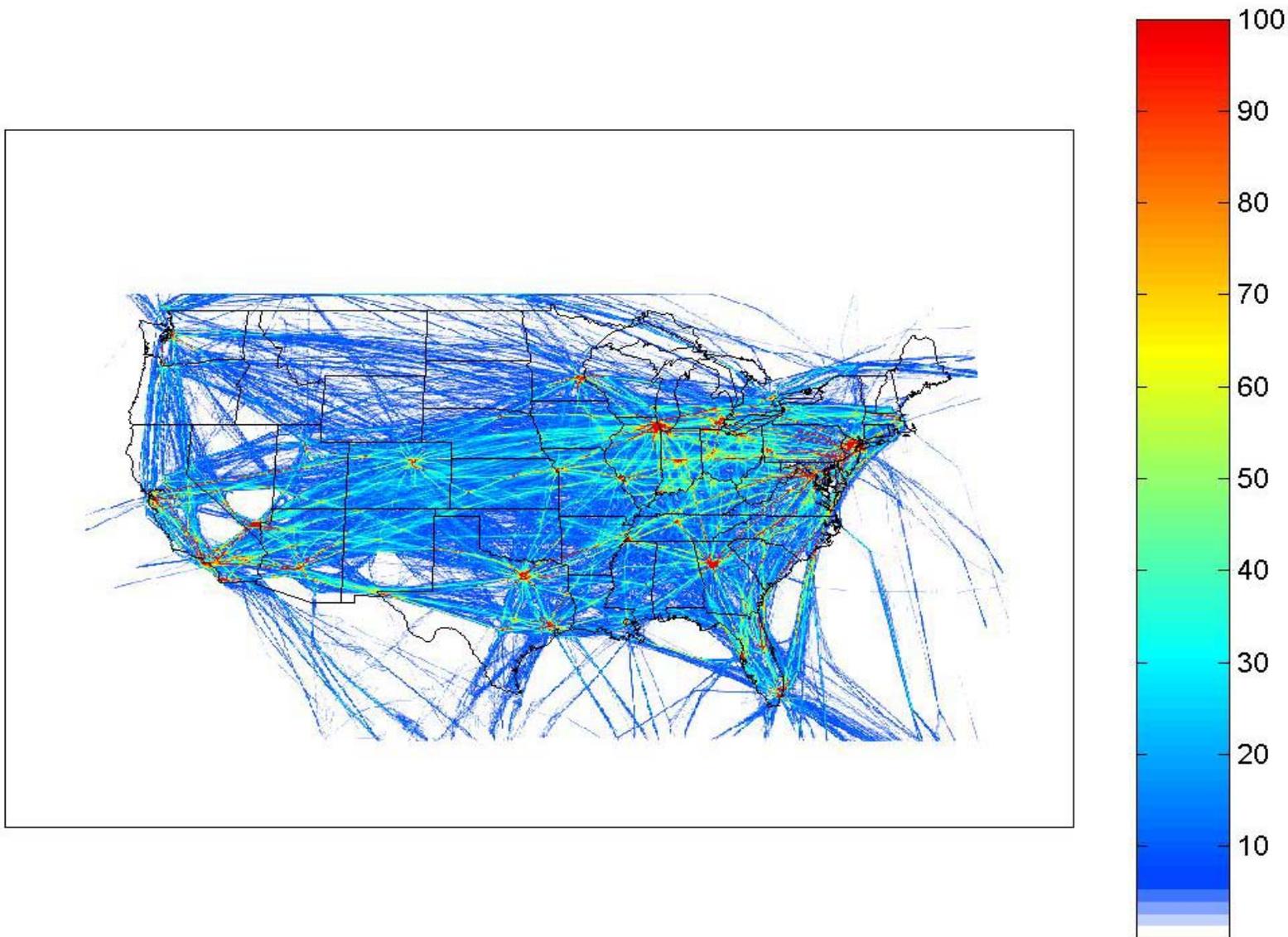


Wide Body Traditional Jets

January 2003 Turboprop Density

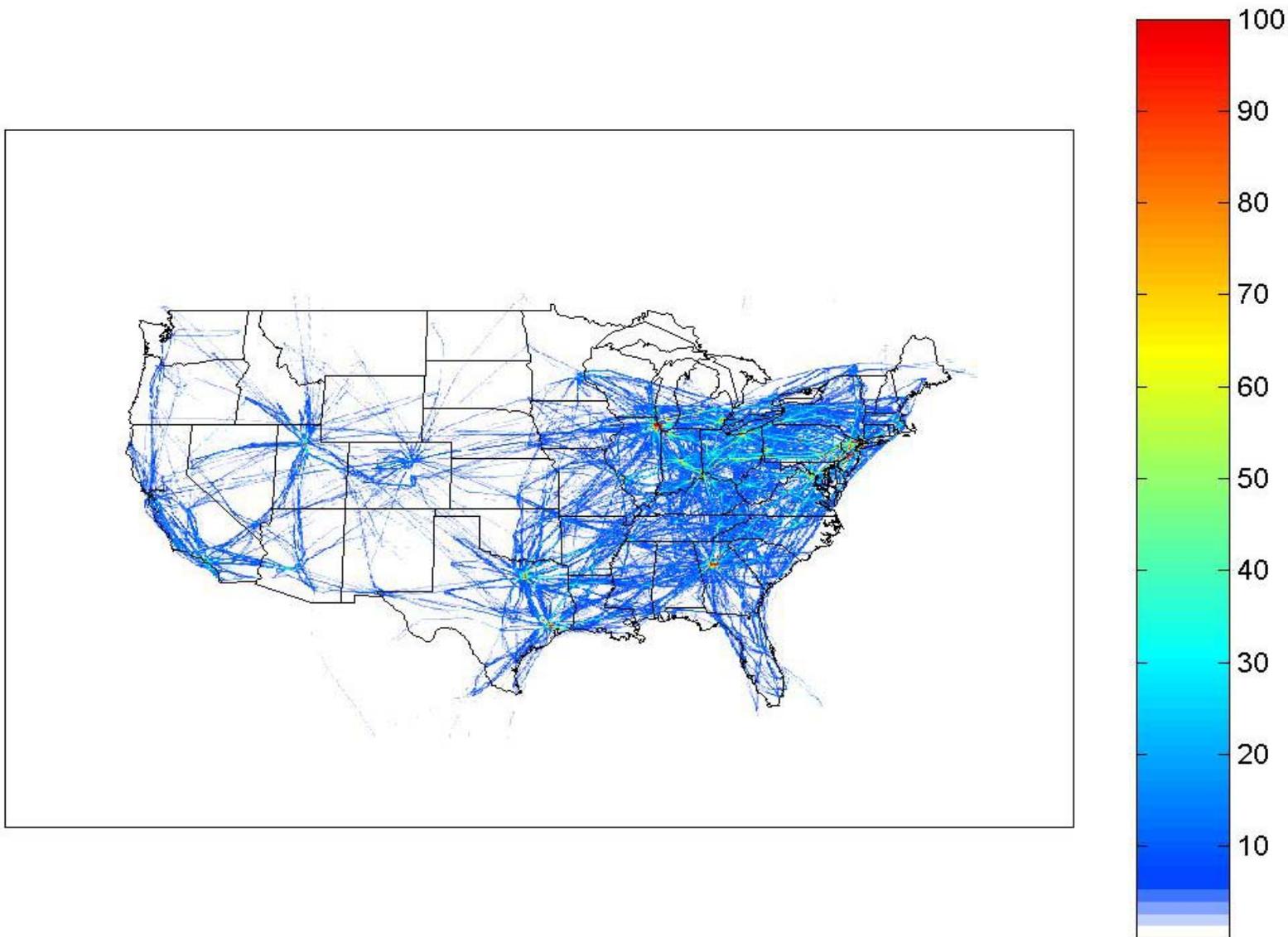


January 2003 Narrow Body Traditional Jet Density



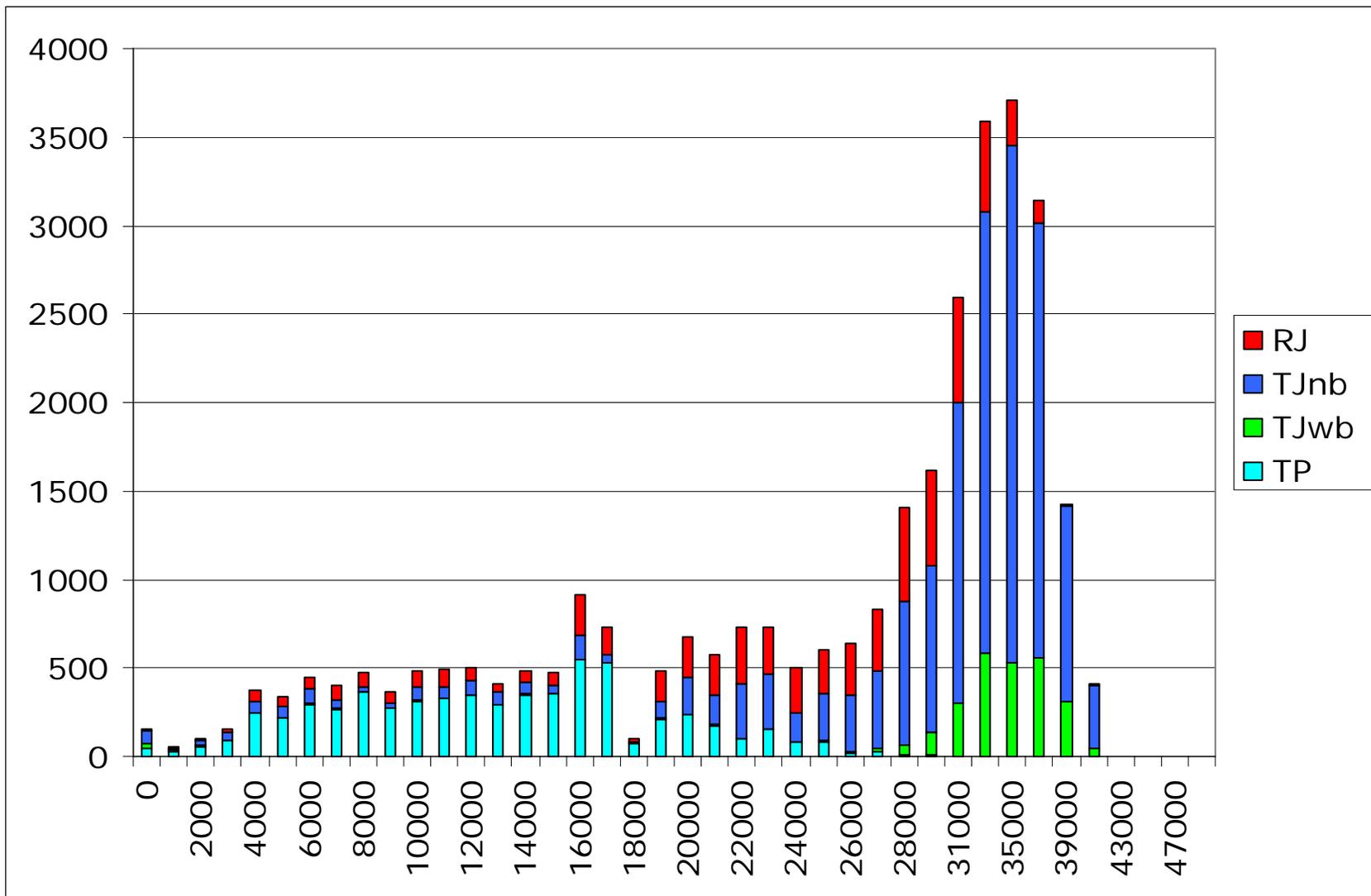


January 2003 Regional Jet Density

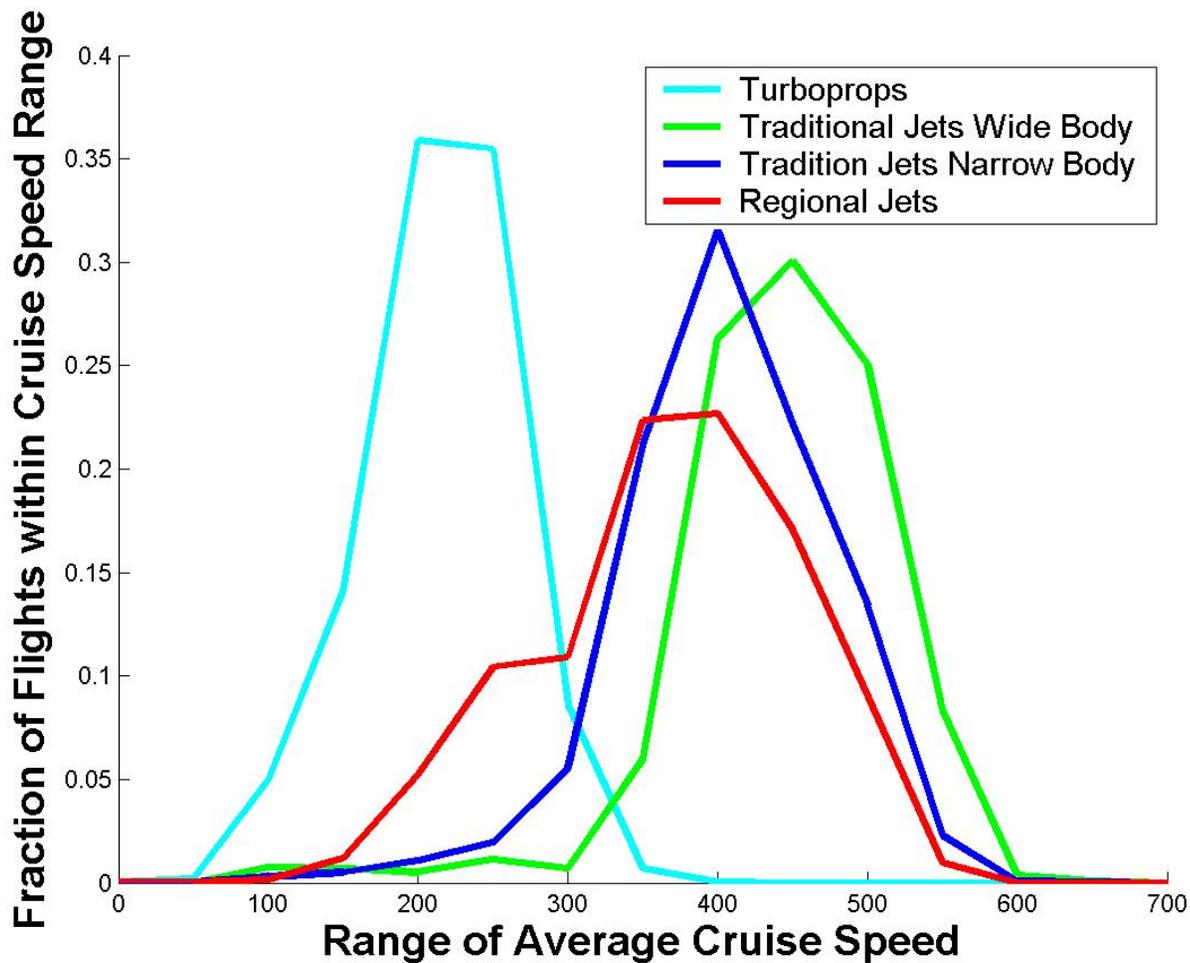




January 2003 Altitude Distribution by Aircraft Category



2003 Average Cruise Speed





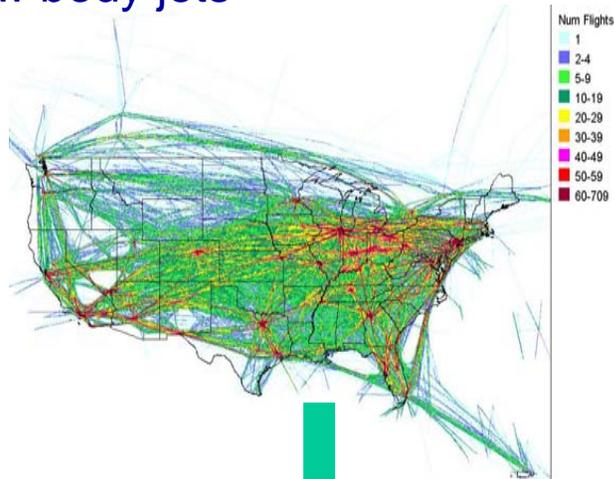
Comparison of Operations in Europe and the U.S.

U.S. Flight Patterns

Wide body jets



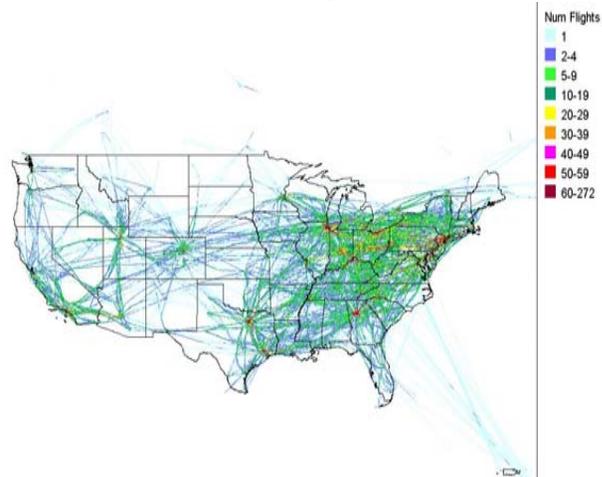
Narrow body jets



Turboprops

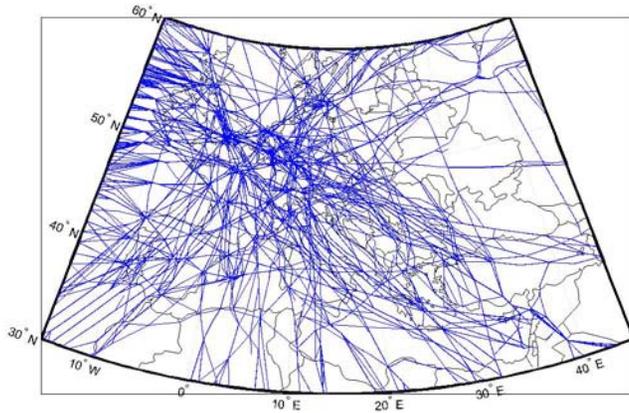


Regional jets

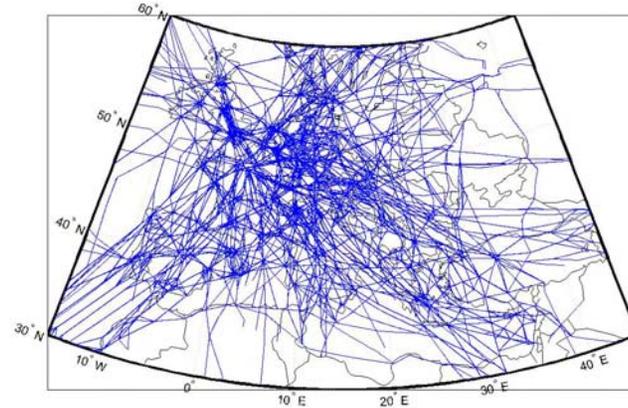


European Flight Patterns

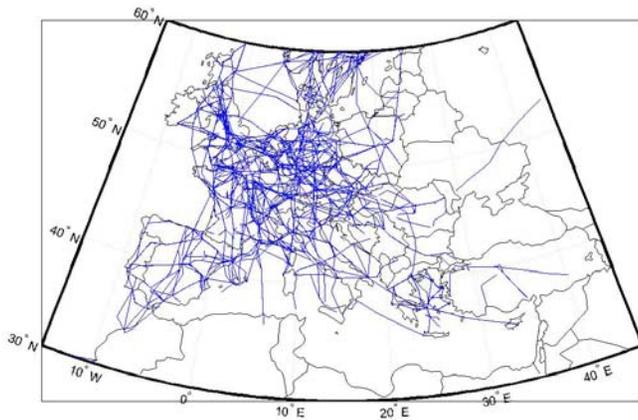
Wide body jets



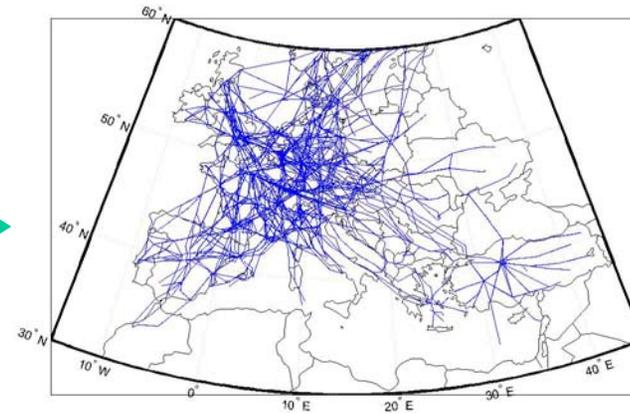
Narrow body jets



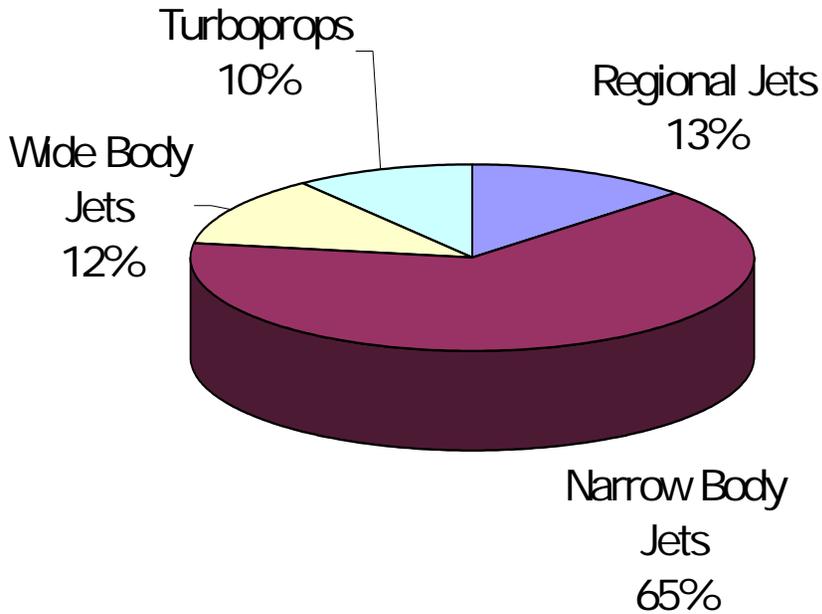
Turboprops



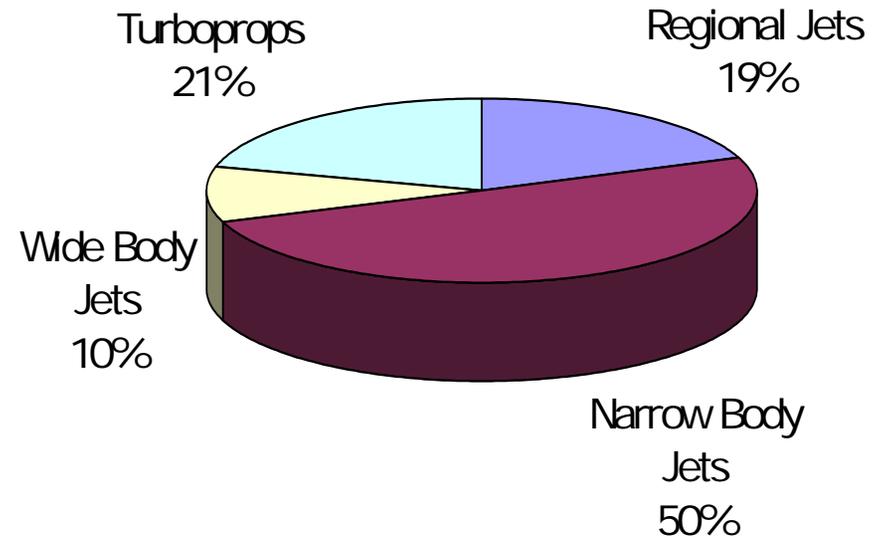
Regional jets



Fleet Mix Comparison



Europe: Total Flights 18,954



USA: Total Flights 35,300



Implications of Regional Jet Operations

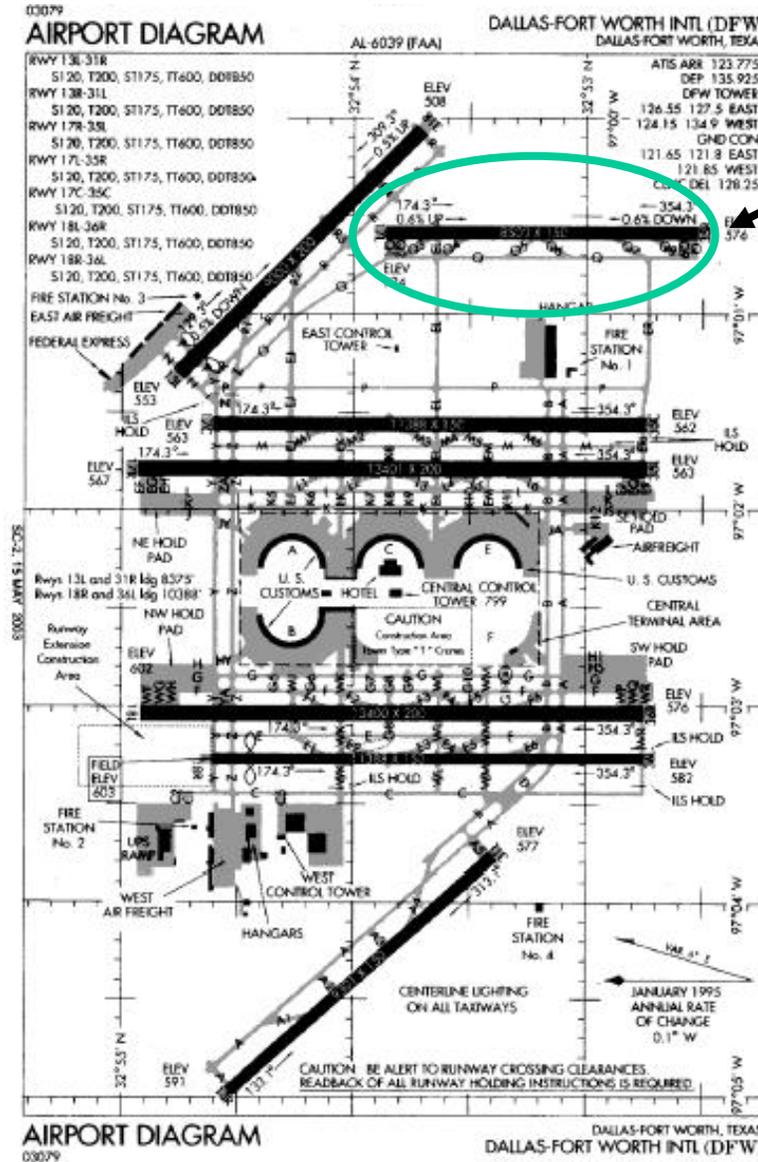


ATC Concerns

- Impact on congestion and delays at the airport and terminal areas
 - Regional jets are replacing turboprops which can use different runways and departure routes than traditional jets
 - Traditional jet replacement will increase the number of operations per person
 - Regional jets are rumored to exhibit a slower climb rate than traditional jets

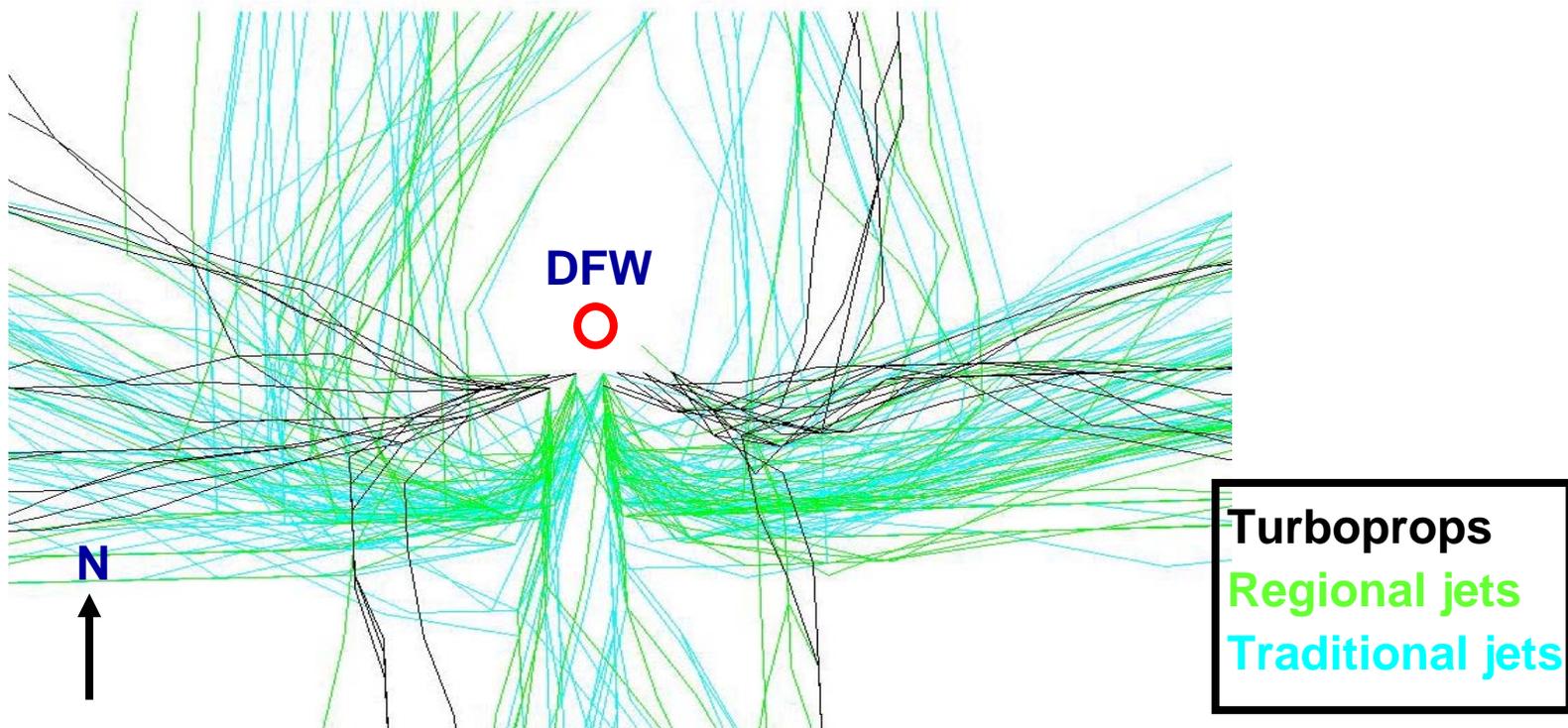
Dallas Fort Worth Airport Surface Diagram

8500 feet



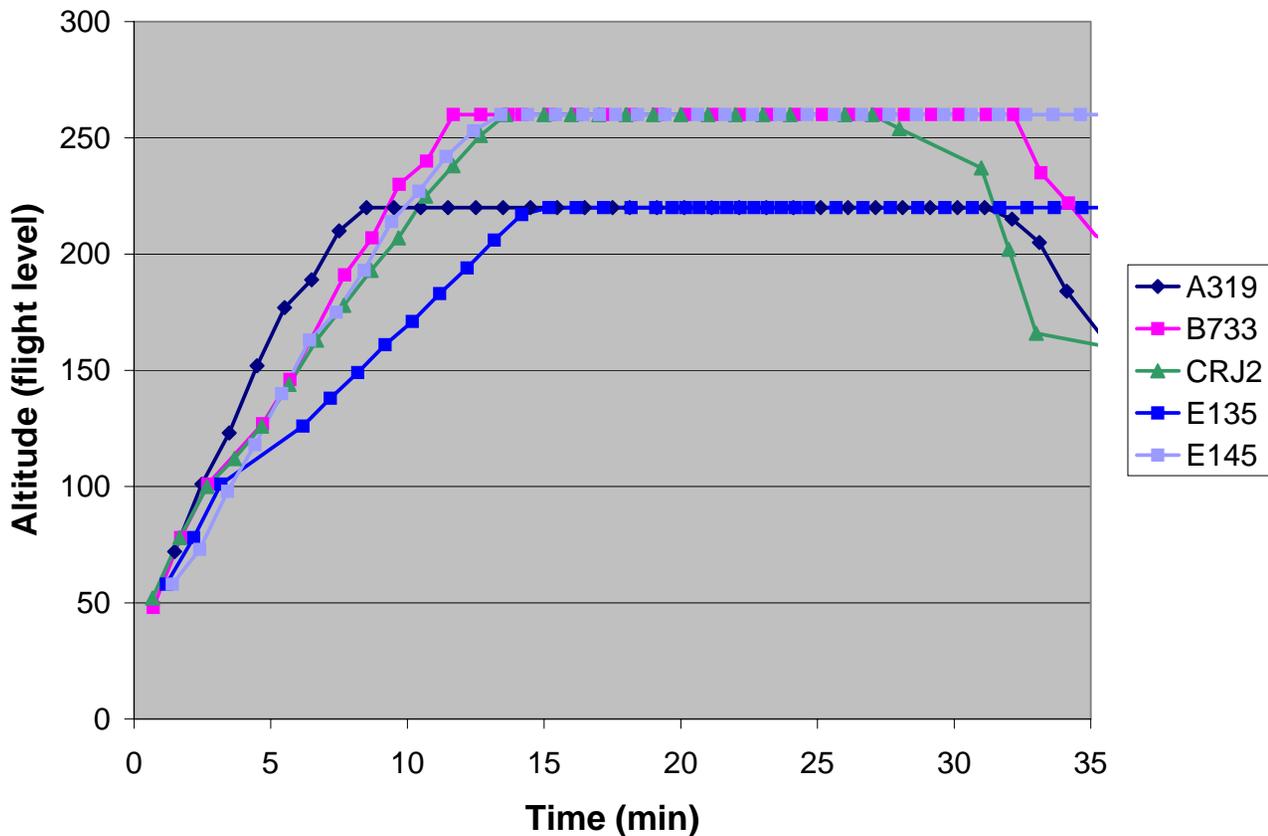
Segregation of Turboprop and Jet Departure Tracks

DFW departures between 0000 and 0500 GMT



- ❑ Regional and traditional jet tracks are integrated
- ❑ Turboprop tracks are segregated

Differences in Climb Performance



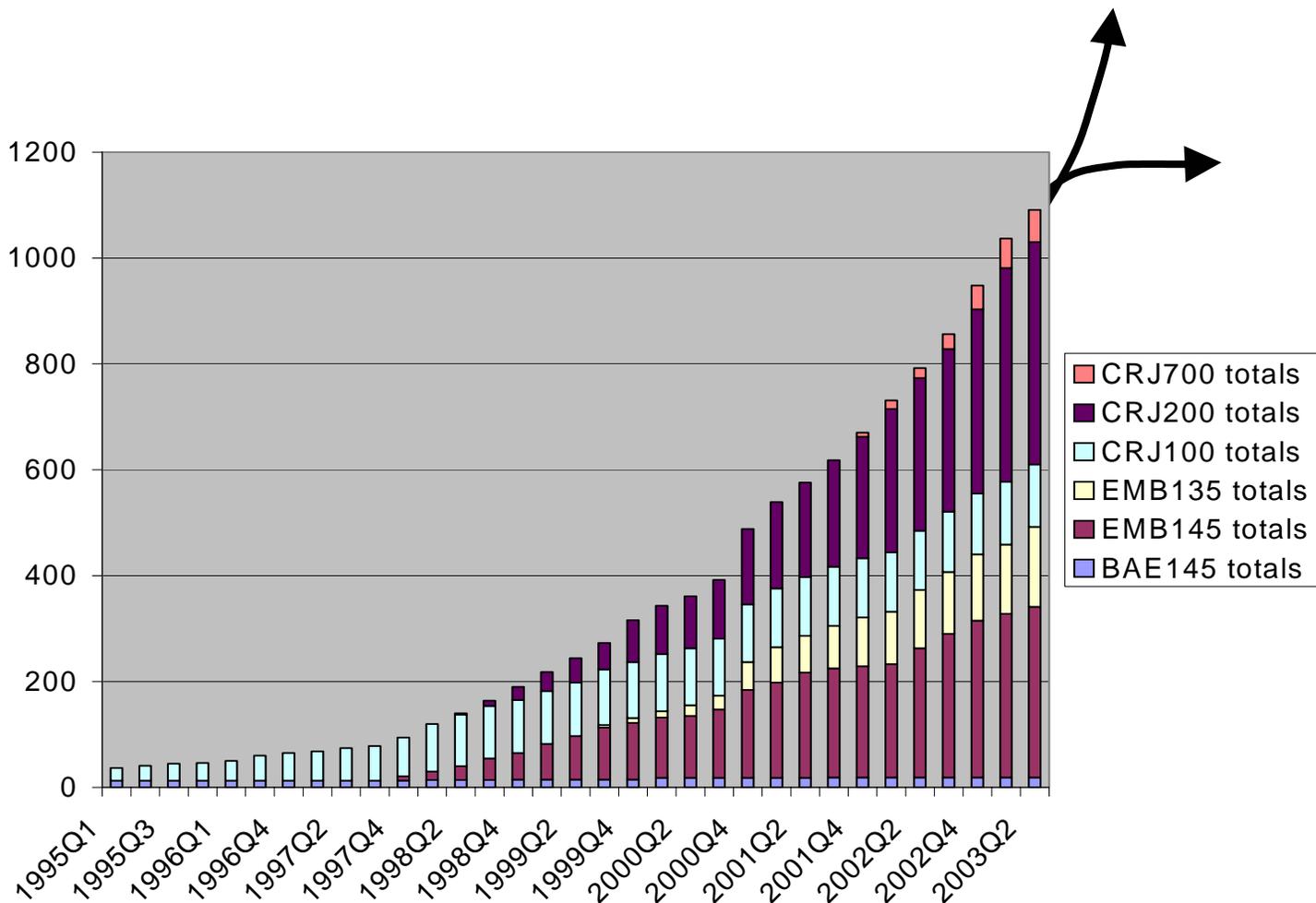
- ❑ E135 exhibits a slower climb rate
- ❑ Minimal difference between the climb rates of the E145, CRJ2, and the traditional jets



The Future of Regional Jets



Uncertainty of Future Regional Jet Growth





Uncertainties facing Regional Jets

- ❑ **When economic conditions improve, demand will increase, leading to need for increased capacity**
 - Regional jets on major routes will either be replaced by narrow bodies or larger regional jets.
 - The displaced planes will either replace turboprops and/or provide point to point service.
- ❑ **What will be the successful airline business model?**
 - The trends indicate that the model will include regional jets.
 - What will be the form of the labor contracts and code share agreements?
- ❑ **Bombardier and Embraer are building bigger aircraft what will be the impact?**
 - Will this lead to future competition with Boeing and Airbus?
- ❑ **What will be the international patterns of regional jet development?**
 - China is planning on building the AR

Future Regional Jets

ERJ 190 (98 seats)



CRJ 900 (86 seats)



ARJ (72-99 seats)



- Jet Blue ordered 100 E190s
- US Airways ordered 60 CRJ2s, 25 CRJ7s, and 85 E170s



Questions